JOIN THE REVOLUTION: QUICK-BUILD HELICOPTERS

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MODEL Airplane NEWS

50 Hot Summer Picks

THE BEST NEW RC STUFF!

BACKYARD AEROBATICS
LOW-BUCK PERFORMANCE

Multi-blade props
BALANCE THEM RIGHT EVERY TIME

WE TEST-FLY
Shoestring—ARF racer
Sopwith Pup—built-up warbird
Odyssey—electric glider
CAP 232—gas-powered aerobat

AirAGE PUBLISHING
JULY 2002
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MODEL Airplane NEWS

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BY DEBRA SHARP

Summer sneak preview

At this year's annual RC airplane trade show in Toledo, hosted for the 48th time by the Weak Signals RC Club, the "state of the hobby" was incredibly strong and upbeat, with literally hundreds of new products hitting the market. We picked 50 of our favorites, and you'll find them in this issue's special eight-page "Air Scoop." Most interesting was the variety of new planes and gear—from a ⅓-scale, almost-ready-to-fly (ARF) Sukhoi to a 7-ounce ducted-fan MiG to a miniature, indoor electric helicopter. Giant-scale models and engines made up a majority of the new releases, but backyard flyers continue to increase in popularity, with dozens of new models and power systems becoming available. We're also excited about the newest generation of electric ducted-fan models. Check out these and other great new RC products on page 12.

Frank Gagliardi takes first place in Class A San Diego scale for this beautiful Eindecker E-III. Check out our coverage starting on page 62.

ROTARY ROUNDUP

RC helicopters are enjoying an increase in popularity these days, due mostly to the availability of high-quality, low-cost models that can be built in just a few hours. Some of these ARF helis even come with engines installed! If you've ever wanted to get into rotary flight, you won't want to miss associate editor Rick Bell's "Almost-Ready-to-Fly Helicopter Guide" on page 32. It also includes basic tips on tools, training gear, equipment installation and troubleshooting vibration.

BALANCING PROPS

Reducing vibration is very important in fixed-wing aircraft; it helps to minimize wear and tear on your engine and airframe. One of the easiest ways to do this is to balance your prop. In this month's "Real Performance Measurement" column, Dave Gierke shares easy, step-by-step procedures that will ensure your success, whether you're flying with wood or composite 2-, 3-, or 4-blade props. Don't forget to perform this important step before you fly!

HOT WING TRICKS

Pattern enthusiasts will appreciate Dan Wolanski's detailed description of the figure-N and its variations. Although this maneuver looks simple, it can be difficult to master; check out Dan's in-depth analysis and tips on page 104, and you'll be on your way to adding this versatile maneuver to your flight repertoire.

Aerobatics aren't limited to large RC craft; the newest generation of electric-powered backyard flyers is capable of performing the most outrageous maneuvers. Check out guest columnist Jef Raskin's "Backyard Flyer" on page 88, and see what the WattAge Crazy Max, a 35-inch-span aerobat, can deliver.

ARF CONTEST

Don't forget to send in your entry to the "Great RC Redesign Contest" by September 1, 2002; the top winner will be awarded more than $500 in cash and prizes. Any personalized, commercially available ARF model is eligible; send photos and a 100-word description to us at man@airage.com or 100 East Ridge, Ridgefield, CT 06877-4606 USA. Good luck and good flying.

MODEL Airplane NEWS
FOUNDED 1929

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PITTS PURSUIT

I have been contemplating purchasing a Pitts Special such as the one from Great Planes that Gerry Yarrish highlighted in his April column about balancing biplanes. I love these aerobatic bipes and even got a ride in a full-size, two-place Pitts last year at the Oshkosh Air Venture airshow. The Great Planes Pitts is beautiful but a little bigger than I want. I have scratch-built models for a long time; does *Model Airplane News* have plans for the Pitts Special in smaller sizes? Thanks for the help.

RANDY WATKINS
Milford, NJ

Randy, wow! I'd love to ride in a Pitts! And at Oshkosh, to boot; I'm dying of envy! Yes, the new Great Planes ⅓-scale ARF Pitts is a beauty, and at 68 inches, it is a big biplane. Model Airplane News *has a couple of Pitts plans, both smaller than the ⅓-scale model I highlighted in my April 2002 column. First is a ¼-scale Pitts S2B designed by Mark Sirianni. This sport-scale flyer has a 61-inch span and is well suited to either a .90 or a 1.20 4-stroke engine. Published in the March 1995 issue, the plan number is FSP03951, and it costs $24.95. The other is a smaller S1A version designed by Jerry Nelson. The model first appeared in the April 1974 issue and is a 48-inch span, .60-size aerobatic bipe. It is very true to scale and uses relatively traditional wood construction techniques that were popular in the '70s. The plan number is FSP04742, and it costs $19.95. Both plans will produce great flying models, and you should have no problem building from them. I've seen both plans, and they're worth having if you love Pitts Specials.* GY

GREAT RC REDESIGN CONTEST

I'm interested in the ARF Redesign Contest you announced in the May issue, but I have a question about the rules. You show a photo of a scale ARF, a trainer and an electric, but nowhere in the announcement does it mention helicopters. Are ARF helis eligible, too? [email]

TED WELWOOD

Oops; sorry for the omission. Of course, ARF helicopters are eligible! In fact, we have an ARF heli guide in this issue (see page 32) filled with choppers that would make an excellent starting point for a contest entry. If your heli sports some personalized touches, submit your entry with a photo and a description, and remember to include your name, address and daytime phone number. For the rest of the entry info, see page 64 of the May issue of Model Airplane News. *The deadline for submissions is September 1, 2002. Thanks, Ted, and good luck!* MB

CABLE QUESTIONS

I enjoy Gerry Yarrish's "Thinking Big" column and hope he'll continue to talk about control systems and other related giant-scale items. Keep up the good work. I hope he can answer a few questions.

1. Is it true that steel control cables cause radio interference? Nelson Hobby Specialties has an RF cable insulator. Is this necessary?
2. What do you think of Kevlar cables?
3. Where can I purchase an electric clamping tool for the brass tubes to correctly swage my metal cables together? [email]

RADLEIGH

Radleigh, thanks for reading my column; I appreciate reader feedback. Here are my answers.

1. It is true that if you run your radio's antenna close to steel cables, you can get radio reception interference. I have not experienced any interference with steel cables because I always route my antenna outside of my plane and rarely install it inside the fuselage. Whenever possible, I attach the end of the antenna to either the tip of the vertical fin or to the horizontal stab.

2. I have used Kevlar pull/pull systems many times before, and they work very well and last a long time. You can tie them in knots instead of looping and swaging their ends to connect them to the clevises. A drop of thin CA glue secures the knot forever. Be sure to use plastic fairleads (short lengths of plastic tubes) where the Kevlar might rub against wood. Vibration will cause the Kevlar to cut into the wood.

3. You can find good swaging (crimping) pliers at RadioShack and at most electrical equipment outlets and some good hardware stores. Look for ones that have wide jaws. Take care of those cables, and they'll take care of you. GY

SMALL ENGINES

It was great to see some coverage of ½A airplanes in your June 2002 issue. People sometimes forget how important these little planes were to the origins of RC; thanks for giving them the attention they deserve. In Dave Gierke's sidebar on ½A engines, he mentions upping the nitro content of the fuel to between 25 and 35 percent, but he doesn't say anything about oil content. Should the oil remain the same?

ADAM LYNCH
Spokane, WA

Thanks, Adam; we, too, feel that these little planes are sometimes overlooked among the bigger and flashier models, and we wanted to remind everyone of the amazing quality and diversity available in the ½A class. With regard to your question, it is a good idea to bump up the oil content slightly in ½A engines. At the high rpm and temperatures at which these engines run, some extra lubrication can really help long-term reliability. A good rule of thumb is to add castor oil to your fuel mix until the oil content is about 20 percent. This should safely protect your engine and give you an optimum balance of performance and reliability. GY ✈

AIR SCOOP

by the Model Airplane News *crew*

WE HIT THE JACKPOT at this year's hobby shows, with more new RC models and gear unveiled than ever before. Here are our top picks for the 2002 flying season; remember, you saw them here first!

Summer Sneak Peek!

The **50** best new products

HOUSE OF BALSA
.10-SIZE FLOAT PLANE

House of Balsa has made a name for itself among kit-building enthusiasts everywhere by offering some of the highest-quality kits available; it's continuing that fine tradition with the introduction of the new Chea-Pass Float Plane. The kit features all laser-cut balsa and plywood parts. The .10-size plane, with a 45½-inch wingspan, has interlocking parts to ensure an accurate assembly, and the kit includes isometric drawings and step-by-step instructions. It requires a 4-channel micro radio system and a .09 to .12 2-cycle engine, and it sells for $59.95.

House of Balsa (760) 246-6462; houseofbalsa.com.

MODEL TECH
P-47D ARF

The popularity of almost-ready-to-fly warbirds seems to be growing daily, and it's no wonder with models such as Model Tech's new P-47D on the market. The 67-inch-wingspan model features a fully sheeted stabilizer, retractable landing gear, a painted fiberglass cowl, a custom-made aluminum spinner and an open-structure elevator and rudder for a truly scale appearance. It's constructed of wood and foam with iron-on covering, and the kit even includes hardware for retracts or fixed gear. The P-47D requires a .60 to .91 2-stroke or .80 to 1.00 4-stroke engine. It sells for $229.99.

Model Tech; distributed by Global Hobby (714) 964-0827; globalhobby.com.

HANGAR 9
P-51D AND SUKHOI 31 ARFS

The P-51 is one of the most recognized warbirds of all time—and probably one of the most modeled. Now, Mustang fans have yet another option. The new .60-size Hangar 9 P-51D Mustang ARF comes finished in an UltraCote trim scheme with authentic markings that include the name on the nose and the ID number on the tail. The model comes with a painted fiberglass cowl, molded Merlin exhaust stacks and factory-installed retractable landing gear. The Mustang has a 65.5-inch wingspan and should be powered by a .60 to .78 2-stroke or .91 to 1.00 4-stroke engine. It costs $254.99.

Hangar 9's new ⅓-scale Sukhoi 31 is capable of the most aggressive 3D maneuvers imaginable. The 97-inch-span aerobat is constructed of balsa and ply and covered in UltraCote. The kit includes a painted fiberglass cowl and wheel pants, and Hangar 9 offers an optional hardware package that includes nearly everything you'll need to get the job done. The Sukhoi requires a 60 to 80cc engine, and it sells for $849.99.

Hangar 9; distributed by Horizon Hobby Inc. (217) 355-9511; horizonhobby.com.

WATTAGE
F-86 SABRE ARF

If you're searching for a ducted-fan foam flyer that combines minimum effort with proven performance, listen up! The new WattAge F-86 Sabre features foam construction, a painted fuselage and a detailed scale decal sheet. Powered by a WattAge 400F fan motor and power-fan unit, the F-86 Sabre provides great flight performance. It comes with nearly everything you'll need, including the power-fan unit, clear canopy, a painted, molded-plastic nose cone and wingtips. This foam warbird has a wingspan of 29.5 inches and sells for $99.95. **WattAge**; distributed by Global Hobby (714) 964-0827; globalhobby.com.

MORRIS HOBBIES
SLEDGE 540

With 674 square inches of wing area, this new 46.5-inch aerobat should be quite a performer when it's powered by the recommended .40 to .53 2-stroke or .52 to .72 4-stroke engine. This kit features all laser-cut parts and retails for $99.95. We hear that an ARF version may be coming soon, so stay tuned!

Morris Hobbies (281) 364-8011; mvvs.com.

DESERT AIRCRAFT
DA50-R GAS ENGINE

Desert Aircraft's new DA50-R 50cc gas engine is ideally suited for 15- to 23-pound models and produces 6,600rpm turning a Menz 22x10 prop. It weighs 3.18 pounds with standoff mounts or 2.94 pounds without. Price: $549.

Desert Aircraft (520) 722-0607; desertaircraft.com.

FMA DIRECT
M5

The lightest dual-conversion receiver we've seen yet, this 5-channel unit weighs less than ⅓ ounce! It's available on negative or positive shift and will retail for $60 to $80.

FMA Direct (301) 668-7615; fmadirect.com.

GREAT PLANES
RYAN STA-M ARF AND FIREBAT ELECTRIC ARF

The Ryan STA is a favorite of modelers, and Great Planes' new military version of the "Golden Age" classic, the STA-M, is sure to become just as popular. This all-wood, MonoKote-covered built-up ARF flies as great as it looks. Great Planes paid attention to details and included a painted-fiberglass cowl and wheel pants, reinforced nylon engine mount and high-quality Great Planes hardware. This 82-inch-wingspan beauty is capable of scale military maneuvers, weighs slightly more than 10 pounds and has a wing loading of about 23 ounces per square foot. The Ryan requires a .60 to .91 2-stroke or .70 to 1.20 4-stroke engine with a 4- or 5-channel radio and 6 standard servos and costs $499.99.

You have to love the way electric RC embraces exciting new airplane designs such as this Firebat foamie pusher jet from Great Planes. The Firebat looks like a modern jet fighter and features functioning canards that add slow-speed stability. The delta wing with canards adds up to an impressive 342.7 square inches of wing area with a 31.25-inch span for a very friendly 10.1 ounces/square foot of wing loading. Another bonus is the room in the fuselage for radio gear: the Firebat is designed to accept standard-size servos. It includes a Speed 400 motor and two props, and it can be built in a couple of hours with simple tools and some epoxy. A deluxe version adds an ESC, an 8-cell, 1100mAh battery and a charger. You'll only need to supply a 3-channel radio, two servos and a servo extension. Street prices: about $55 for the standard kit; $110 for the deluxe.

Great Planes Model Mfg. (800) 637-7660; greatplanes.com.

SR BATTERIES

BANTAM AND BANTAM BIPE

These beauties are both designed around the popular power system used in the GWS Tiger Moth and Pico Stick. Each has a wingspan of 39 inches; the mono has 210 square inches of wing area and weighs about 8 ounces; the Bipe has a full 350 square inches and weighs about 8.5 ounces. Early reports on the Bantam suggest flight times in the 5- to 6-minute range, with speed and maneuverability suitable for mild outdoor flying and indoor flying in basketball-court-size venues. The Bipe flies more slowly, so it is even better for indoor RC. Both kits are of laser-cut high-quality wood. The Bantam kit costs $49.95; the Bipe costs just $5 more. SR Batteries offers package deals that include complete power systems, as well as the receivers and servos needed to complete the kit.

SR Batteries 631-286-0079; srbatteries.com.

HITEC RCD

ELECTRON 6

The latest receiver from Hitec RCD, this dual-conversion, 0.60-ounce unit has 6 channels and offers great range for a great price: $65 without a crystal.

Hitec (858) 748-6948; hitecrcd.com.

LANIER RC

LASER 200 AND F-86 SABRE

Lanier is pleased to add another fine aerobatic workhorse to its 21st Century line of almost-ready-to-fly (ARF) models: the giant-scale Laser 200 kit. It has a 96-inch wingspan, weighs between 17 and 22 pounds and is built of precision-cut balsa, plywood and spruce with a fiberglass cowl. The Laser 200 can be powered by a 3.2 to 4.2 2-stroke or 2.4 to 3.0 4-stroke engine and sells for $749.99.

Looking for a warbird unlike any other? Then this new ARF F-86 Sabre Jet should turn heads at the local tarmac. The Sabre has a wingspan of 52 inches and weighs 5.5 pounds. The fuselage is constructed of fiberglass and is reinforced with lite-ply formers, while the wing is built up of balsa and spruce. The prop-driven jet should be powered with a .40 to .47 2-stroke engine. It sells for $249.99.

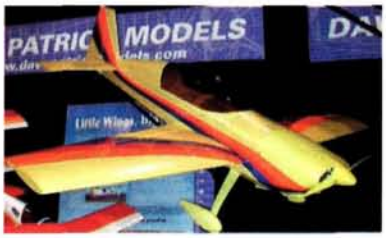
Lanier RC (770) 532-6401; lanierrc.com.

DAVE PATRICK MODELS

ULTIMATE AND EXTRA 330L

Dave Patrick's new .40-size Ultimate offers unlimited aerobatic performance for those who have limited budgets. The Ultimate comes in full-color covering ($249), all-white covering ($229), or ready-to-cover with your own scheme ($199). It features a 43.5-inch wingspan and 630 square inches of wing area.

Fans of larger models should take a look at the new Extra 330L. This is 120-size aircraft measures an impressive 76 inches—larger than most 120s. Designed to be light (13 to 14.5 pounds, ready-to-fly) for its size (1,222-square-inch wing area), it has unusually gentle slow-speed characteristics without compromising aerobatic performance. It's available in three trim levels; the full-color ARF is $429; the white ARF is $409, and the ARC is $379.



Dave Patrick Models (815) 457-3128; davepatrickmodels.com.

Z-PLANES

A-10

The popularity of electric-ducted-fan (EDF) park flyers is gaining momentum, as is the popularity of warbird park flyers. Combine the two, and the result is a must-have model. The new A-10 from Z-Planes requires not one but two EDF units, and its lightweight, profile design makes it a great fun-fly model. The 35-inch-wingspan A-10 features foam wings and a foam-core fuselage; the elevator and ailerons come pre-hinged. The kit also includes detailed instructions and decals, and it sells for $89.

Z-Planes (219) 662-1199.

AVEOX
BRUSHLESS MOTORS

Electrics fliers are sure to get a charge out of these three new sensorless motors. The 27/13, 27/26 and 27/39 motors offer more performance, convenience and durability for less money. Sensorless motors make wiring your speed controls a lot simpler. Prop spin the wrong way? Swap any two of the three wires, and your problem is solved. The motors use high-grade magnets and internals and are rated for 180 degrees C and 50,000 rpm. The 27/13 weighs 80.5 grams and costs $120; the 27/26 weighs 123 grams and costs $125 to $140; the 27/39 weighs 161 grams and costs $135 to $150. A variety of ESCs and gearboxes are available for each.

Aveox Electric Flight Systems (818) 597-8915; aveox.com.

JR
RTF VENTURE

Who says you can't have it all? With the new, almost-ready-to-fly Venture CP CCPM helicopter from JR, you get the precision flight control of CCPM that's necessary for beginners combined with a versatile design that can be adjusted for advanced aerobatics. One helicopter fits all, and it sells for $299.99.

JR; distributed by Horizon Hobby Inc. (217) 355-9511; horizonhobby.com.

GWS
BUSH PLANE

This new, all-foam-fuselage de Havilland DHC-2 Beaver park flyer has nice sport-scale looks and needs no paint—it's ready for the included decals. Also included are a muscular little 370 motor and gearbox, joined and ready to pop right onto the stick motor mount. All you need to finish off the DHC-2 is a 3-channel radio and a GWS flight pack. Look for a street price of $45.

GWS; distributed by Horizon Hobby (217) 355-9511; horizonhobby.com.

FUNAERO
STAUDACHER 300

This 66-inch-wingspan model weighs about 7 pounds and requires a .61 to .91 4-stroke engine. The kit includes all laser-cut balsa and lite-ply parts and even comes with a set of wheel pants. Best of all, you get a CAD-generated plan that will have you in the air in no time at all. The new Staudacher 300 is available for $169.95.

FunAero (803) 499-5487; funaero.com.

GIANTSCALEPLANES.COM
LARK 70

Having recently introduced its Swallow 90 to the pattern-plane market, GiantScalePlanes.com is sure to catch the eyes of aerobat enthusiasts once again with this Lark 70. The 59-inch-wingspan Lark ARF can be powered by either a .46 2-stroke or .63 to .70 4-stroke engine. Its fuselage is built up of lite-ply, and the wings are constructed of sheeted foam. Cost? Only $199.99.

GiantScalePlanes.com (610) 282-4811; giantscaleplanes.com.

VERTICAL RC
KATANA TERZI T-30

When paired with a geared Speed 280 or 300 motor and 9-cell, 720mAh NiMH pack, this 12-ounce model delivers 6 to 8 minutes of vertical aerobatics! The 32-inch-span model features durable molded-foam parts, balsa control surfaces and a complete hardware package, all for only $65 (plus S&H).

Vertical RC (866) 674-1006; verticalrc.com.

DJ AEROTECH
MORE "ROADKILL" MODELS

DJ Aerotech's popular line of profile, stand-off-scale model kits has been increased with seven new designs: a Curtiss Jenny, Sopwith Camel, Fokker Dr.1 triplane, Douglas C-47 Skytrain and DC-3, a Curtis P-40 and a Lockheed Electra! Like the other Roadkill models, these are powered by geared N-20 motor(s) and are made of laser-cut balsa and ply. Each comes with the motor(s) and propeller(s), linkages and landing gear. With prices that range from $48.95 to $66.95, the most difficult thing about these models is deciding which ones to get!

DJ Aerotech (937) 773-6772; djaerotech.com.

WAHOO INTL.
REPAIR KIT

Make strong, light repairs to fiberglass, wood, metal, or plastic with this $20 travel kit that features Solarez, a thin fiberglass- or microballoon-filled paste that will cure in sunlight in about 45 seconds; no heat or long waits are required. The kit includes two, 2-ounce tubes of Solarez, a 4-ounce bottle of laminating resin, sandpaper, fiberglass, scissors, acetone and spreaders.

Wahoo Intl. (760) 967-7873; solarez.com.

FAN-TASTIC MODELS
F-86 SABRE AND MIG 15

MiG Alley is now as close as your favorite indoor and schoolyard flying sites with these two exciting models. The Sabre spans 25 inches and the MiG, 25½ inches; they are designed to use the GWS-50 ducted-fan unit on a 7-cell, 150mAh or 8-cell, 300mAh battery. Molded of extruded polystyrene foam, the jet fighters can be built quickly and require three channels for exciting dogfights. Length—22 in. (Sabre); 22½ in. (MiG); weight—7¼ to 7¾ oz.; radio req'd—3-channels w/2 microservos and 5A ESC. Price—$60.

Fan-Tastic Models (817) 379-6468; fantasticmodels@charter.net.

BALSA USA
¼-SCALE FOKKER D-VIII

Balsa USA has added another model to its growing line of large-scale WW I fighters. This time, it's the Fokker D-VIII. This often overlooked subject spans 82 inches and uses traditional balsa and ply construction. With its thick airfoil and large wing area, the D-VIII is a great adversary for any of Balsa USA's Allied fighters. Length—59.5 in.; weight—12 to 14 lb.; engine req'd—G-23/1.20 4-stroke; radio req'd—4-channel w/5 servos. Price—$250 or less.

Balsa USA (906) 863-6421; balsausa.com.

AEROWORKS
KATANA S

The Aeroworks booth was a big draw at this year's Toledo show, and the credit for that almost certainly goes to the new Katana S. With its bright-yellow finish and tremendous size, this 35-percent aerobat caught the attention of show-goers far and wide. The Katana S has a 104-inch wingspan, is 94 inches long and requires a 100cc engine. It's available in three versions: kit ($749); prebuilt ($1,500); and deluxe ($2,500).

Aeroworks (303) 366-4205; aero-works.net.

SAITO
4-STROKE ENGINE

For years, modelers have extolled the virtues of Saito 4-stroke engines. They've always featured great power-to-weight ratios, one-piece cylinder-head systems, precision craftsmanship and, of course, that unforgettable, realistic sound. Now you can have all of this in an in-line twin engine. With its narrow width and at 2ci, the new FA-200TI is perfect for scale warbirds. It has just enough power for the 1.20-size warbird you've been dying to get in the air. It weighs 1.46 grams and sells for $749.99 with mufflers.

Saito; distributed by Horizon Hobby Inc. (217) 355-9511; horizonhobby.com.

CENTURY JET MODELS

CORSAIR PAIR

Century Jets showed off a pair of distinctive and beautiful scale warbirds at Toledo this year; both of them carry the name Corsair. For you classic fighter buffs, the giant, 100-inch F4U features a reinforced composite fuselage, wings and flying surfaces ready to install. The wings plug in, and they come with ribs and spars installed. Scale cockpit kits are available, as are scale retracts with 1-inch-diameter Oleo struts and a door-sequencing kit. Price: $1,495.

For the jet jocks out there, this ⅐-scale reproduction of the A-7 Corsair is loaded with scale detail and is designed to be flown with most of the 17- to 27-pound turbines on the market. The 66.5-inch, three-piece composite wing has ailerons, flaps and molded-in panel lines. The entire structure is epoxy-glass and Nomex honeycomb. All the flying surfaces are composite, and the fuselage is roomy, which makes turbine installation easy. Scale gear (Navy or Air Force spec), scale or sport tires and brakes are all available. Price: $1,895.

Century Jet Models Inc. (502) 266-9234; centuryjet.com.

SUPER KRAFT

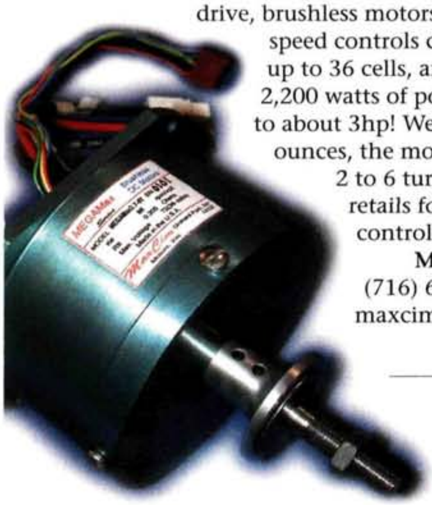
F3D-30

Available in both glow- and electric-powered versions, the F3D-30 is constructed of balsa and lite-ply, coated with fiberglass and painted in a red and white color scheme. Its streamlined design not only makes it great for pylon racing but also ideal for sport flying. The 55-inch-wingspan model comes with almost everything you'll need, including landing gear, main wheels, mounted tailwheel, decals and all of the necessary hardware. All of the control surfaces are prehinged, and the servo trays are already installed. Simply drop in a radio system and a powerplant, and you're off to the races. The glow version requires a .32 to .39 2-stroke engine, and both versions sell for $157.77.

Super Kraft (877) 203-2377; kangkeusa.com.

MAXCIM MOTORS

MEGAMAX 3.7



Looking for a clean, quiet power system for your latest 10- to 30-pound, ¼-scale airplane? MaxCim's new direct-drive, brushless motors and digital speed controls can be used with up to 36 cells, and they provide 2,200 watts of power—equivalent to about 3hp! Weighing in at 45 ounces, the motor is available in 2 to 6 turns per coil and retails for $639.99; the controller is $220.

MaxCim Motors (716) 662-5651; maxcim.com.

PEAK ELECTRONICS

SIRIUS CHARGE

This product is for serious electrics enthusiasts! The newest charger in the Sirius line, this fast field charger works with 4- to 6-cell, 1000 to 4000mAh packs and will deliver 2 amps of current to two packs at once. The Sirius Charge features universal receiver connectors, dual cooling fans and reverse polarity protection; it costs $169.95.

Peak Electronics (859) 679-4952; siriuselectronics.com.

GRAUPNER

MINI STARJET

Fast climbs, crazy aerobatics, inverted flight—this Speed 400-powered foam flyer is capable of performing just about any maneuver you can throw its way. The 33-inch-wingspan model is constructed of high-density foam and can be assembled in just a few hours. It has a one-piece wing with molded-in servo locations and launch grips. Graupner recommends that you use a radio with elevon mixing. You can get the Mini StarJet alone for $59, but if you're looking to save a few bucks, order the entire package (it includes radio, motor, battery, charger and accessory pack) for just $279.

Graupner; distributed by Hobby Lobby Intl. (615) 373-1444; hobby-lobby.com.

NORTHEAST SAILPLANE PRODUCTS
PARKHAWK AND ACCORD II

Can you say "radio-controlled ornithopter?" Constructed of carbon fiber, fiberglass and ripstop nylon, this 46-inch-wingspan bird is the result of 10 years of research and development. A Speed 300 motor powers the Parkhawk's flapping wings through a set of gearing that translates rotational energy into the up-and-down movement of the wings. This one-of-a-kind model is capable of 5 to 6 minutes of truly amazing flight. It sells for $199.95.

The folks at Northeast Sailplane are not only busy producing new and original designs, but they're also hard at work improving the old ones. The Accord II is a new and improved version of the popular backyard aerobat, the Accord and is capable of longer flight times, better climb and significantly improved overall performance. The longer, 36-inch wingspan and Speed 400 motor with 4.5:1 reduction drive combine to produce a model capable of aerobatic, and even 3D, flight. The Accord's wings come built up with D-tube construction with a carbon-fiber spar for reinforcement, and the entire model is covered in Solarfilm. For only $139.95, you get the ARF model, landing gear, clear canopy, wheels, Speed 400 motor, MP Jet reduction drive, prop, prop adapter and a complete set of hardware.

Northeast Sailplane Products (802) 655-7700; nesail.com.

OHIO MODEL PLANES
35-PERCENT EDGE 540

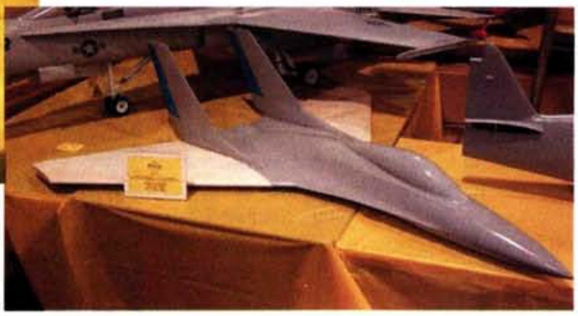
A new breed of champion, this popular aerobat will satisfy the most demanding pilot. Its unique construction and high-quality materials yield a 103-inch-span aircraft that's capable of exciting 3D maneuvers. Powered by a 100cc gas engine, the 26-pound Edge 540 has a respectable wing loading of 30 ounces per square foot, so it definitely flies as good as it looks. Wingspan—103 in.; area—1,981 sq. in.; weight—26 lb.; radio—4-channel w/8 servos; engine—100cc. Price—$650.

Ohio Model Planes (937) 429-3056; ohiomodelplanes.com.

THE WORLD MODELS MFG. CO. LTD.
EXTRA 300S ARF

This new, almost-ready-to-fly aerobatic wonder features light yet strong construction and excellent flight characteristics. The large-scale Extra is available in three attractive schemes and requires a 1.60 2-stroke engine. Wingspan—80.5 in.; weight—14 lb.; length—71 in.; radio req'd—4-channel w/6 servos. Price—$450

The World Models Mfg. Co. Ltd. (925) 371-0922; theworldmodels.com.



YELLOW AIRCRAFT
STINGRAY AND ARF AEROBATS

If you can't make up your mind which size of model to fly, then the several new ARF models from Yellow Aircraft are sure to help you decide. From the larger 72-inch-span Edge 540T and Giles G-300 (each $379) to the midsize, 60-inch-span Sukhoi 31 and Giles G-300 ($249) and the economical 54-inch-span Extra 300S, CAP 232 and Sukhoi 31 ($139), these high-quality ARFs are excellent performers.

The Stingray is a new budget turbine trainer that spans 52 inches and requires an 11- to 12-pound-thrust turbine. The body is made of fiberglass, and the wing panels are foam-cores sheeted with balsa; it retails for $395.

Yellow Aircraft (781) 674-9898; yellowaircraft.com.

FULTON'S HOBBIES
THE NIBBLER

The Nibbler combines all the charm of classic ½A models with the modern convenience of 21st century materials and assembly features. It has a fiberglass fuselage, foam-core wings, laser-cut formers and aluminum landing gear. The 36-inch-wingspan model comes with a cowl and canopy and all of the necessary hardware. The Nibbler requires a .15 to a .21 engine and sells for $99 (standard kit); $125 (deluxe kit); and $185 (complete kit with MDS .18 engine).

Fulton's Hobbies (304) 233-5355.

SIG MFG.
AEROBATIC SPITFIRE ARC

Do you have a great concept for a scale Spitfire, but you don't have the time to build a kit from the ground up? The new Spitfire Mk IX ARC (almost-ready-to-cover), manufactured by Hacker for Sig Mfg., is a great compromise. To save you time, all the heavy construction has been done, but the beautiful fiberglass fuselage, tail surfaces and sheeted-foam wing are uncovered. Wingspan—67.25 in.; weight—8 to 10 lb.; engine—.61 to 1.20 2-stroke or .90 to 1.50 4-stroke; 4-channel radio with 5 servos. For $509.99, the Spitfire comes with all required hardware, fuel tank, spinner, fixed gear, wheels, pushrods and decal sheet.

Sig Mfg. Co. Inc. (800) 247-5008; www.sigmfg.com.

ASTROFLIGHT
MICRO FAN

Designed for use with AstroFlight's popular 010 brushless motor, this new unit runs on 7 or 8 cells and spins its 2-inch fan at 30,000rpm! It draws 5.5 amps of current and provides 50 watts of power. For only $29.95, who can resist the urge to build a micro-electric jet?

AstroFlight (310) 821-6242; astroflight.com.

VOLTAIR TECH
FLOATING CUBE

This 14-inch-square, kite-like RC model can turn in its own axis and uses a rotating motor/prop unit to control horizontal movement (U.S. and international patents are pending). The 6.5-ounce model features a solid carbon-fiber structure and Icarex Ripstop polyester lifting surfaces. For about $200, the Cube comes nearly ready-to-fly with a motor, heat sink, prop, speed control, servo and 8-cell, 220mAh NiMH pack.

Voltaire Tech (530) 273-3855; voltaircube.com.

ALTECH/MRC
HIROBO HELIS

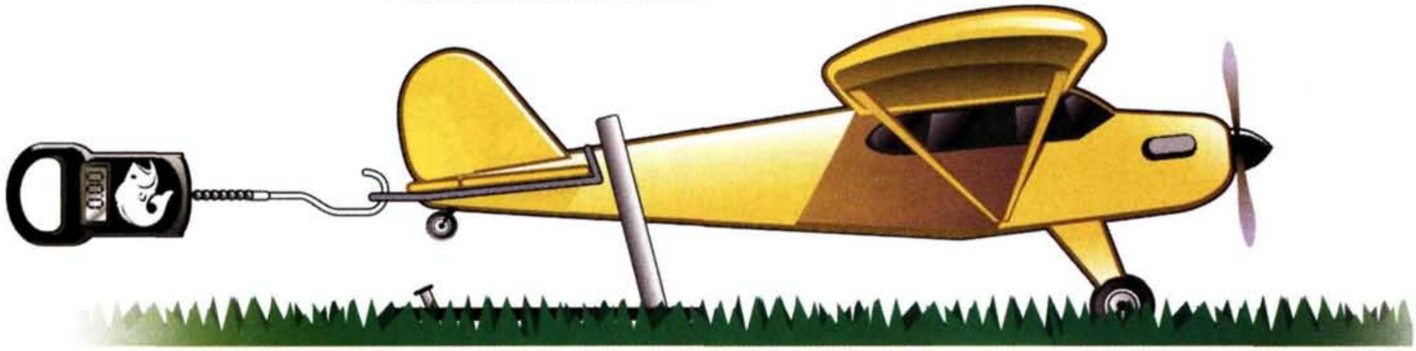
Hirobo has both ends of the RC helicopter spectrum covered! On the small side, Hirobo debuted the Mini Electric Lama. This scale, electric model is less than 1 foot long and is a great flyer; we tried it, and the counter-rotating props gave it remarkable stability. It's expected to cost about $250 for heli, radio and power system.

If you believe that bigger equals better, then the enormous gas-powered Bell 222 that we got a sneak peek at should be about the best heli around. Its mechanics will be based on the Eagle 2 GS, power will come from a 40cc gas engine, and early estimates have it priced at around $5,800—fully painted and finished.

Altech/MRC (Model Rectifier Corp.) (732) 225-6360; modelrec.com.

TIPS & TRICKS

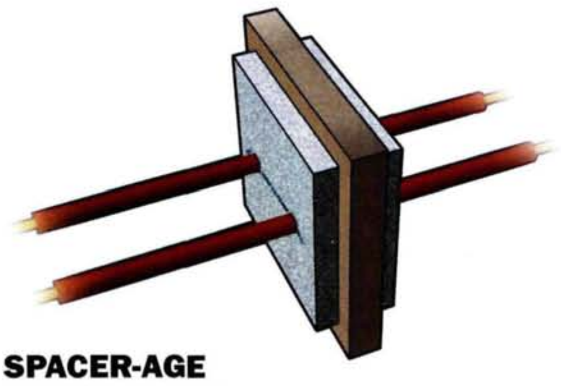
SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



THRUST IS A MUST

Many modelers use rpm as an indicator of the thrust that their engine/prop combination produces, but here is a relatively simple way to get an actual measurement of the model's pull. Fishing scales can easily be adapted to measure static thrust. Loop a cord or strap of sufficient strength to the back of your airplane and hook the loose end of the cord through the hook on the scale. Position the tail a few inches from a safety stand just in case your cord comes loose, then run your engine up to full power and read the scale to get your thrust. Note that this reading will be static thrust, which is somewhat different from what the prop produces while in motion, and that there will be a slight loss due to the friction of your landing gear. Those two factors remain fairly constant, however, and allow you to effectively compare the thrust produced by several props or needle settings on the same airplane.

Harry Jenkin, Neptune City, NJ



SPACER-AGE TECHNOLOGY

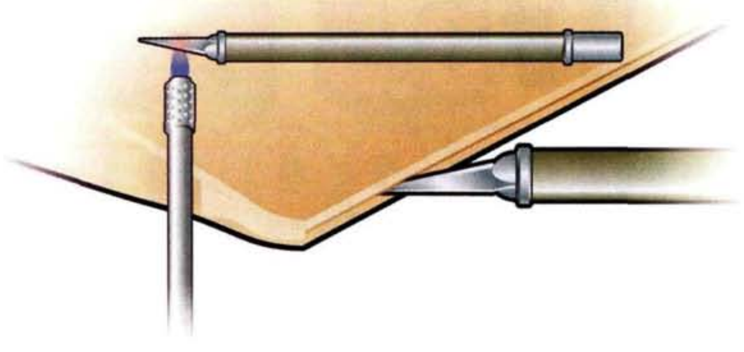
Flexible pushrods (such as Sullivan Gold-N-Rods) can benefit from added support inside the fuselage. A good way to do this is to make a foam spacer inside one of the bulkheads near the center of the model. The foam holds the rods in place but allows some fore and aft movement in case the rods expand or contract due to temperature changes. The spacer itself adds almost no weight and is easy to install, either while building the model or as a modification later on.

Roger Caron, San Jose, CA

HOT HINGE SLOTTER

Hinges work better when the slots are right in the middle of the trailing edges of the control surfaces, but it's sometimes tough to cut through the wing-sheeting glue joint to get them perfectly centered. An easy way to slice through the dried glue is to heat an old hobby-knife blade with a propane or butane torch. The hot blade will melt the glue enough to allow you to easily cut your hinge slots. If you need to slot solid wood, turn the blade around and use the thick end to burn through the wood. If you moisten the wood with some water, the blade's heat will burn only where it directly contacts the wood; otherwise, it may scorch the surrounding wood.

Roger Claude, Show Low, AZ

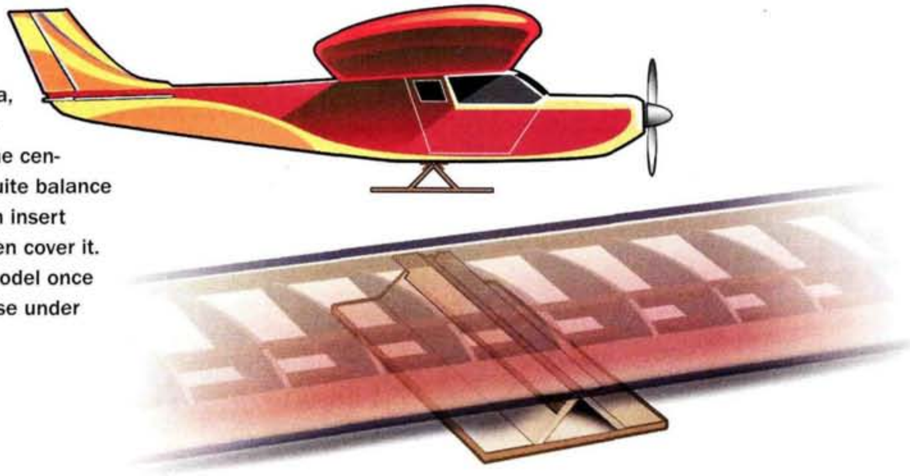


PACK WRAP

Store-bought battery packs almost always come covered in shrink-wrap, but if you solder your own packs, it can be difficult to find wrap of the right size and shape—especially if you make odd-shaped packs. A good source of abundant shrink-wrap is a boat dealership, where workers shrink-wrap boats for transport and discard scraps and used sheets by the square yard; most times, they'll let you have it for free. One trip to the boat dealer can secure enough wrap for years of RC use.

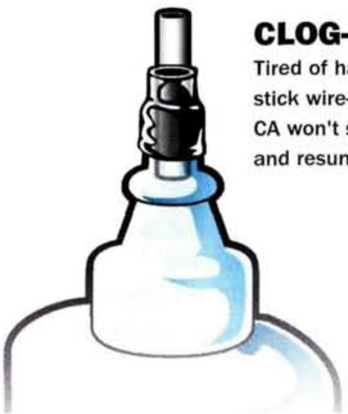
Dawson Gillaspy, Long Neck, DE

AN AIRPLANE TEETER-TOTTER?



Not exactly; this is a simple way to balance the parts of your model. Make a small triangle out of scrap balsa, and on each side create a masking-tape hinge. To balance your wing, mount the triangle lengthwise down the centerline of the wing or wing joint. If your wing doesn't quite balance and you do this check before you've covered it, you can insert weight inside the light wing until it is balanced, and then cover it. You can use the same triangle to balance the whole model once it has been assembled. Just place the triangle widthwise under the fuselage at your desired CG, and then add weight until it balances. Note that you may have to take off the gear to use this method. In that case, drape the gear pieces on top of the fuselage about where they'd be mounted to simulate their effect on the CG.

Jon Putnam, Portland, OR



CLOG-FREE GLUE TIPS

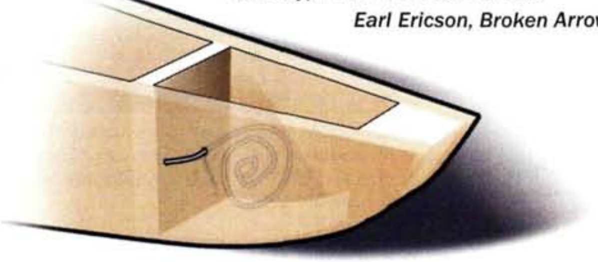
Tired of having to clean out your CA bottle applicator tips? Try this: cut off the tip and replace it with a length of non-stick wire-insulating Teflon spaghetti tubing; 14-gauge, 0.010-inch wall thickness works well. Most of the time, the CA won't stick to the Teflon, but if it ever does, you can simply pull up a little more of the tubing, clip off the clog, and resume building. A short length of heat-shrink tubing around the Teflon-to-bottle joint ensures a leak-proof joint.

Jerry Patterson, Redding, CA

TIDY TAIL-WEIGHT TIP

Here's a clean, clever way to add tail weight to a nose-heavy airplane that doesn't require a messy or difficult installation. When you build your model, install a thin bulkhead at the very rear of the fuselage, forming a ballast box. After the plane has been fully assembled, if it requires tail weight, drill a tiny, $\frac{1}{16}$-inch hole in the side of the fuselage where the ballast box is. Feed lead-based solder through the hole until you have enough to balance the plane, plus a little extra. Then draw the solder back out and clip it off a small piece at a time until it is balanced exactly as you want. You can tape the end of the solder to the side of the plane while you test-fly it, then continue to adjust the weight until it is right. When it is, push the loose end back into the plane, and cover the hole with a small square of covering material. If you made the ballast box small enough, the solder won't shift around enough to cause a problem, and it is soft enough so it won't harm the balsa. Though the method described is for tail weight, it should work for nose weight as well, as long as you fashion the same type of sealed ballast box.

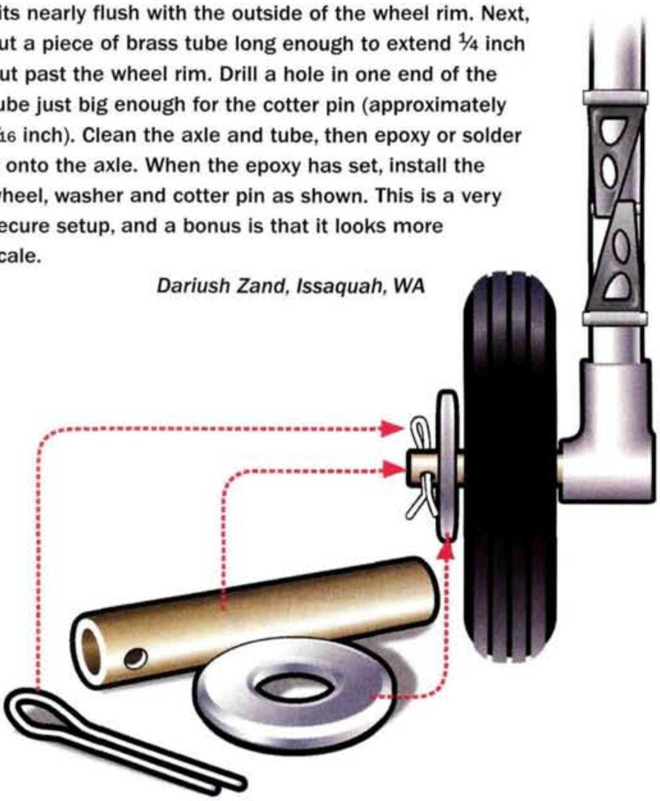
Earl Ericson, Broken Arrow, OK



SCALE AND SECURE WHEEL FASTENER

If you've ever lost a wheel in flight because you couldn't tighten the setscrew on your wheel collar enough, you'll appreciate this method for securing wheels. You'll need some $\frac{5}{32}$-inch-i.d. brass tube, a few brass washers and two small cotter pins. Cut the piano-wire axle so that it sits nearly flush with the outside of the wheel rim. Next, cut a piece of brass tube long enough to extend $\frac{1}{4}$ inch out past the wheel rim. Drill a hole in one end of the tube just big enough for the cotter pin (approximately $\frac{1}{16}$ inch). Clean the axle and tube, then epoxy or solder it onto the axle. When the epoxy has set, install the wheel, washer and cotter pin as shown. This is a very secure setup, and a bonus is that it looks more scale.

Dariush Zand, Issaquah, WA



SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Zachary and Patrick Winters
Spokane, WA
SIG ASTRO HOG

Eleven-year-old Zachary and his dad built this sharp-looking Astro Hog; they chose it as their first kit to build together. The Hog has a 71-inch wingspan and is powered by a Magnum .75 turning a Zinger 12x7 prop. The father-and-son team flies the classic MonoKote-covered plane with a Futaba T6XA 6-channel radio.

Ted Ruffo
Palm Bay, FL
LANIER RC EXTRA 300S

Check out the finish work on this ¼-scale aerobat. Ted painted his Lanier Extra 300S with automotive base coat to match Patty Wagstaff's blue-tail version. After applying all of the Diehard Graphics emblems, Ted covered the entire plane with automotive clearcoat. Ted powers his 14-pound Extra with a 3W .42 engine swinging a 20x10 Zinger prop at 6,500rpm. According to Ted, he had not yet flown the model at the time this photo was taken, but he expects its performance to be great.

Glenn Purser
North Hills, CA
KEN WILLARD-DESIGNED TOP DAWG

Glenn sent in photos of his Top Dawg after he read about the event of the same name in our April issue. He built a .10ci Top Dawg back in 1974 and then upsized the plan a few years ago to accommodate a .30 4-stroke engine. The result is the model you see here. He reports that the upscaled Dawg can really run with the extra power; the controls remain snappy and the plane is fun to fly.

Phil Smock
Bakersfield, CA
WING MFG. WHITE LIGHTNING P-38

Here's a plane that's sure to draw attention whenever Phil flies it. It is a 70-inch Wing Mfg. P-38 kit done up in the color scheme of Lefty Gardner's White Lightning racer. Two Magnum XL 40A engines provide ample thrust, and a Futaba T6XA radio lets Phil put on a show and then bring the P-38 back down to be admired up close. He reports that it flies great and lands like a pussycat.

Carlos Alfaro
San Jose, Costa Rica
GOLDBERG CHIPMUNK

Carlos included the optional flaps on this beautiful Chipmunk that he built from a Goldberg kit. The model is powered with a YS .91 4-stroke spinning a 14x8 prop. Carlos reports that the Chipmunk has an excellent mix of aerobatic maneuverability and steady slow-speed characteristics that makes it a pleasure to fly. Nice job, Carlos!

David Goerne
Streator, IL
SCRATCH-BUILT STEPHENS AKRO

David sent us this photo of his 38-percent Stephens Akro, which he designed and built himself. David powers his 105-inch-wingspan aerobat with a 4.3ci Stihl engine. Pictured with the aircraft is David's grandson, Scott. Believe it or not, at just 15 years old, Scott can already pilot this giant-scale beauty (probably with a little help from grandpa). He's sure to be a force to reckon with at future competitions. Keep up the great work, guys!

Roger W. Weeks
Newberg, OR
ACE LAZY ACE

Roger is very proud of his 76-inch-span Lazy Ace. For a classic look, he covered the bipe with transparent yellow MonoKote and used red and black opaque MonoKote for the trim. Roger uses a JR 783 radio and five servos for control, and the ailerons can also be used as flaps. An O.S. .91 FX powers the 11-pound, 6-ounce bipe with authority to perform rock-steady and graceful aerobatics.

Jim Farned
Biloxi, MS
PROFILE FOKKER DVII

Look closely, and you'll see that this neat little standoff-scale Fokker DVII is actually a profile model. Jim designed and built this plane for use in WW I combat events. It has a 44-inch wingspan and weighs just 3½ pounds, which gives it great scale performance with the .25 engine up front. Its easy portability and good manners make it a good plane for basic fun flying, as well. Jim has drawn a plan for this model and is also working on several other profile WW I combat fighters.

John Foust
Pottstown, PA
THUNDER TIGER FUN TIGER EXTRA
Here, 9-year-old Daniel happily poses with Dad's 48-inch-wingspan Fun Tiger Extra. Both father and son are members of the Swamp Creek R/C Club in Gilbertsville, PA. John powers his airplane with an O.S. .40S 4-stroke engine and controls it with a Futaba Skysport 6A radio with 5-channel operation that includes flaps. The model is covered with MonoKote, and those unique graphics are courtesy of Patrizi Designs.

Jonathan Epp
Steinbach, Manitoba, Canada
SPITFIRE MK. XIV
Jonathan's latest project is this 1⁄10-scale Spitfire from his own plan. The 42-inch span Mk. XIV British fighter is built of balsa and plywood and then covered with ½-ounce fiberglass cloth. Jonathan painted the 3.5-pound warbird with Perfect paints and uses an Airtronics VG6DR radio for flight missions. An O.S. .25 SF powers the Spitfire, and Jonathan made a custom muffler to fit completely within the cowl. For the utmost in realism, Jonathan made the retractable landing gear from an old servo and RC car gears; it takes about 3 seconds for the gear to cycle. To honor his country, Jonathan painted the classic warbird in markings to match RAF Squadron 402, a Canadian squadron that flew Spitfires during WW II.

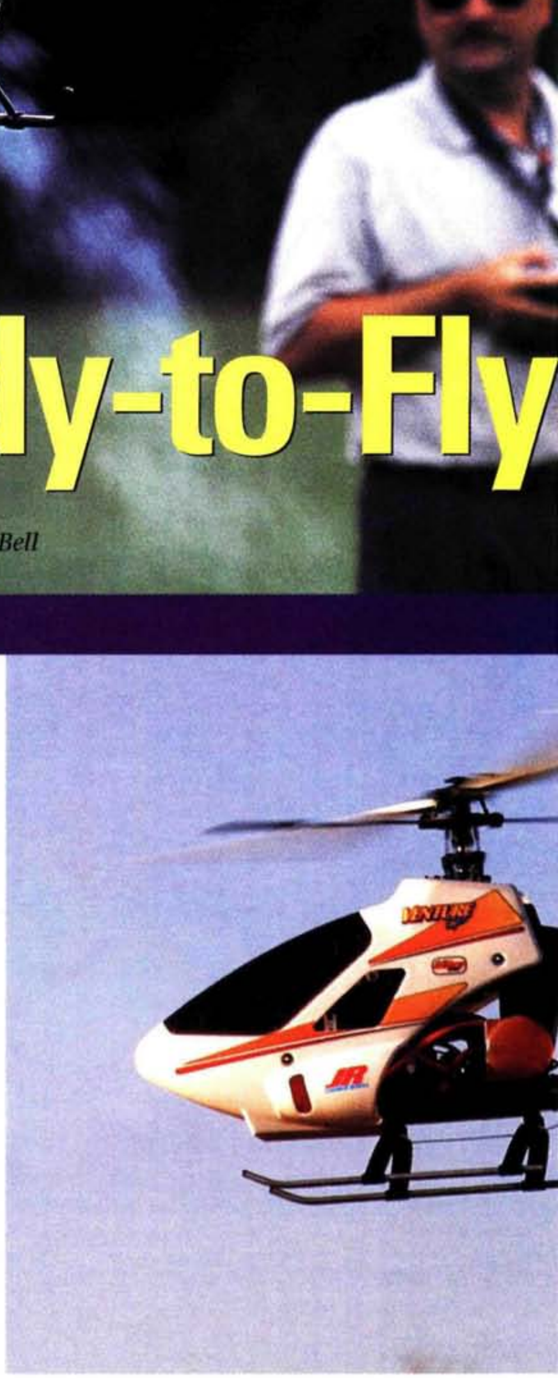
FLIGHT **TEST**

The quick, easy way to rotary flight

Almost-Ready-to-Fly Heli Guide

by Rick Bell

Wild gyrations, inverted hovering and smooth scale maneuvers—welcome to the world of RC helicopters. Though more challenging than learning to fly an airplane, mastering rotary flight can be very rewarding. Helicopters and their equipment have come a long way in the past few years and, just like their fixed-wing counterparts, the availability of almost-ready-to-fly (ARF) choppers is increasing. Instead of spending long hours completely building the machine, bench time has been reduced to just a few hours of placing sub-assemblies on a factory-built chassis and installing the radio system and engine. In some ARFs, even the engine comes installed. We've collected information on the most popular ARF helis, plus we include helpful hints to get you started. If you want to join in the fun and excitement that RC helicopters have to offer, this guide will get you up and hovering in no time!



HOW DO I GET STARTED?

Carefully follow the building guidelines and safety precautions in the helicopter's manual. If you have no RC experience, seek the help of an experienced RC chopper pilot. There are many choices of helicopters, radio systems, gyros and engines. Here's what you'll need at the field.

Thunder Tiger Raptor 30 ARF 49BB

■ **Helicopter.** Today's ARF helis are well-engineered to deliver many hours of flying fun. Best of all, they're inexpensive compared with the helis of just a few years ago. Helicopters (except electric- and gas-powered) are grouped according to engine size: .30 to .35; .40 to .50; and .60. It's best to start with a .30-size heli; it's less expensive to buy, operate and repair. Contact the local heli club and ask for recommendations; experienced heli pilots are invaluable sources of information for initial setup and flight adjustments.

■ **Radio system.** Most helis today have collective pitch, so you'll need a heli radio to fly them properly. Heli radios feature adjustments and mixing capabilities that make setting up and flying helis much easier. A computer radio is the only way to go; it offers throttle and pitch-curve programming to give you the best heli performance. If your budget allows, start with a midrange radio such as the JR 8103, Futaba 8UH, or Airtronics R6000. These are a great investment, and you'll never outgrow them.

JR Webra heli engine

■ **Engine.** It is always best to go with the engine recommended by the heli's manufacturer. Engine choices include ABC or ringed versions; ABCs generally offer more power, but they are easily damaged if they ingest dirt and dust. (They're also intolerant of lean runs.) I think ringed engines are a better choice; they're easier to start and have excellent power. O.S., Webra, Enya and SuperTigre are the most popular heli engines. It's also best to bench run and break in the engine before you install it; this makes it easier to adjust the idle, and most important, the high-end needle settings.

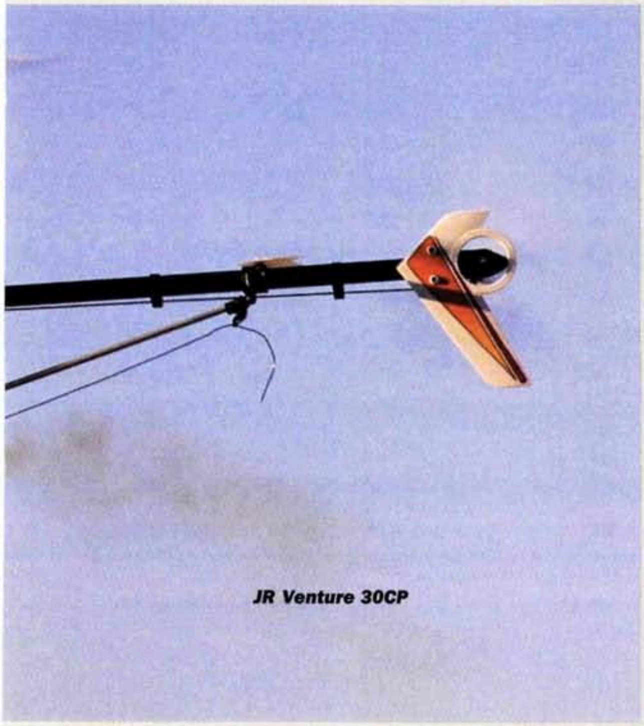
■ **Gyro.** You can choose from many gyros, but it is best to use a simple piezo gyro. Many are available in the $80 to $100 range, and they work much better than mechanical gyros. They are very simple to set up and operate and are ideal for the beginner.

Above: beginners should start with a small piezo gyro such as this Revolution PZ-200. It's easy to use and to set up. It's very powerful and costs less than $90.

■ **Training gear.** A definite must-have for beginners. This makes the heli more difficult to tip and will save many dollars in repairs. (See the "Training Gear" sidebar.)

■ **Building tools.** Good-quality metric Allen drivers and Phillips screwdrivers are essential and make heli building easier. Other useful tools include a blade balancer, pitch gauge, ball-link driver, needle-nose pliers and metric nut drivers.

■ **Starting equipment.** As a general rule, helicopters use the same starting equipment as airplanes, but there are some differences. You can use the same electric starter, power panel and battery and glow igniter (if it will reach the glow plug). Some helis require the use of a remote glow-plug adapter. The difference is in the starting method of the engine. Unlike an airplane's engine, which can be turned over by using the propeller, the heli engine is buried within the chassis and can't be manually started by turning the crankshaft (i.e., it has no propeller). Usually, a shaft with a coupler extends from the engine, and a starting wand is attached to the electric starter that engages the coupler to spin the crankshaft. Other methods for starting heli engines include a top-cone start, which is like using an electric starter on an airplane spinner, and the belt-and-pulley start, which uses a belt around the clutch housing that you engage with the electric starter. These methods are rarely used on newer helicopters, except on Kyosho's helis, which use a cone-start system.



JR Venture 30CP

Use a balancer like this one from Robart Mfg. to precisely balance main rotor heads, tail rotors, clutches and bell housings.

You'll need a variety of metric hand tools to build and maintain your heli, including several sizes of Allen drivers, nut drivers, Phillips screwdrivers, a long-reach glow-plug wrench and a blade-pitch gauge.

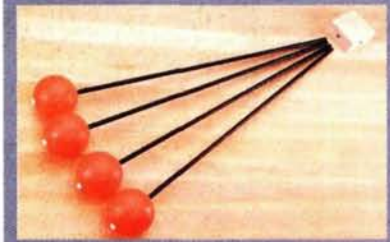
Most helicopters use some sort of wand to start the engine, and there are many wands to choose from. Some starting wands are hex shaped and fit into a matching coupler on the heli. Others are smooth rods that engage a coupler that contains a one-way bearing. When the engine starts, the bearing disengages and allows the engine to over-run the slower-turning starter.

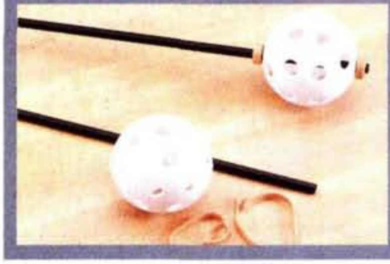
TRAINING GEAR

Several types of training gear are available, and you can even make a set fairly easily. Training gear ranges from training stands (such as the all-aluminum Whiteman Flying Stand, to which you attach the helicopter), to Hirobo's articulated training legs that prevent the heli from tipping over and causing tail strikes, to simple fiberglass rods with Wiffle balls attached to their ends. Regardless of the type you use, training gear will save you time and money.

Why is training gear necessary? When you first learn to hover, your heli will slide around on the ground while you try to maintain a stable hover only an inch or so above the ground. Training gear helps prevent the heli from tipping and allows it to move around with very little resistance. If you quickly close the throttle, the heli lands without any damage. With training gear, it's pretty tough to break anything. Once you master low-altitude hovering with the training gear in place, you'll be more confident when you hover higher, without the training gear in place.

A training stand such as this one from Whiteman Intl. securely holds the heli in a horizontal position and allows complete freedom of movement.





Training gear is mandatory for beginners, and you can make a simple set from a couple of Dave Brown fiberglass pushrods and Wiffle balls (left). The balls are secured with rubber bands that have been CA'd to the rods. The balls can caster, which allows the heli to easily slide along the ground. You can also purchase ready-made training gear such as this set from Heli-Max (above left). It costs less than $15.

FLIGHT SIMULATORS

Practicing with a flight simulator is a great way to accelerate the helicopter learning curve. Flight sims build confidence as you practice new maneuvers, and this is a great help when you go to the flying field to practice. I use a flight sim to learn new maneuvers and to brush up on my skills when I can't make it to the field. Sims save you a lot of repair time and money. Horizon Hobby and Great Planes (pictured here) both have excellent flight simulators that perform flawlessly. Give one a try!

Manufacturer	Model	Channels req'd	Rotor dia. (in.)	Length (in.)	Engine req'd (2-st
Century	Raven CCPM 30 ARF	5	49.5	46	.32 to .38
Century	Hawk IV 30 ARF	5	49.5	46	.32 to .38
Century	Hawk IV 30 ARF w/O.S. .32 SX-H	5	49.5	46	.32 to .38
Century	Bell 47G II ARF	5	53.5	50	.32 to .50
Century	Augusta 109A ARF	5	49.5	47	.32 to .50
Century	Air Wolf ARF	5 to 6	49.5	47	.32 to .50
Century	Long Ranger ARF	5	49.5	49.7	.32 to .50
Century	Bell 222 ARF	5 to 6	49.5	46.5	.32 to .50
Century	Twin Star ARF	5	49.5	46.5	.32 to .50
Hirobo	Shuttle Challenge	5	48	42.5	.32 to .38
Hirobo	Shuttle Plus	5	48	42.5	.32 to .38
Hirobo	Shuttle Sceadu 30 ARF	5	49	47	.32 to .38
Hirobo	Shuttle Sceadu 50 ARF	5	53	47	.46 to .50
JR	Venture 30CP	5	49.5	44.6	.32 to .38
Kyosho	Caliber 30 ARF	5	48.4	43	.32 to .38
Kyosho	Caliber 30 ARF	5	48.4	43	.32 to .38
Kyosho	Nexus 30S ARF	5	47.2	41.3	.32 to .38
Kyosho	Concept 32VR ARF	5	49	42.5	.32 to .38
Thunder Tiger	Raptor 30 ARF 49BB	5	49	43.5	.32 to .38
Thunder Tiger	Raptor 60 V2 ARF	5	60.63	53.94	.60 to .90
Thunder Tiger	Raptor 60 V2 ARF	5	60.63	53.94	.60 to .90

Century Long Ranger ARF

Thunder Tiger Raptor .60 V2 ARF

FITTING BALL LINKS

Every helicopter has many bellcranks, levers and pushrods, and each pushrod uses a ball link to attach it to a ball mounted on the bellcrank, lever or servo. A helicopter can have 24 or more ball links, and if they don't all move freely, the control system will be very stiff. This makes the heli more difficult to control because the servos won't return to center, and you will always have to struggle to keep the heli in one spot. The extra resistance also places a higher load on the receiver battery, and this drains it more quickly.

Ball links of the proper size are the key to smooth control response. The best way to adjust the ball links' fit is to use a ball-link sizing tool, which reams the inside diameter of the link for an exact fit on the ball. I use one as I build the heli and fit each link as I add it to the control system. Another method is to squeeze the link while it's attached to the ball using a pair of pliers; this will also fit it to the ball. Just be careful; if you squeeze too hard, you may damage or break the link (some ball links are brittle).

Helis have many pushrods and bellcranks that must move smoothly and freely; to achieve this, you need properly fitting ball links. An easy way to properly fit links is to use this link reamer from JR. Just pop a link onto the tool and then rotate the reamer. It will remove a tiny amount of material from the link for an exact fit on the ball.

You can also size a ball link by gently squeezing it with pliers when it's on a ball. Just don't squeeze too hard or you'll damage the link.

Included	Weight (lb.)	Price	Notes
No	6.4	$329.95	CCPM control system; hex start; metal swashplate; wire T/D; finished M/R blades; 3D
No	6.4	$249.95	Modular chassis; hex start; metal swashplate; wire T/D; finished M/R blades; 3D
O.S. .32 SX-H	6.4	$339.95	Modular chassis; hex start; metal swashplate; wire T/D; finished M/R blades; 3D
No	7.2	$549.95	Standoff scale; painted truss tail boom; modular chassis; hex start; finished M/R blades; wire T/D
No	7	$529.95	Scale painted FG fuselage; modular chassis; hex start; finished M/R blades; wire T/D
No	7.5	$629.95	Scale painted FG fuselage; modular chassis; hex start; finished M/R blades; wire T/D; retractable landing gear
No	7.5	$479.95	Scale painted FG fuselage; modular chassis; hex start; finished M/R blades; wire T/D
No	7.5	$629.95	Scale painted FG fuselage; modular chassis; hex start; finished M/R blades; wire T/D; retractable landing gear
No	7	$529.95	Scale painted FG fuselage; modular chassis; hex start; finished M/R blades; wire T/D
Enya .35X	6.2	$489	High-stability rotor head; articulated training gear; hex start; belt T/D; finished M/R blades
Enya .35X	6	$349.99	High-stability rotor head; metal swashplate; hex start; finished M/R blades; belt T/D
No	6.4	$455.99	Hex start; modular chassis; belt T/D; FG M/R blades; 3D
No	7	$529.99	Hex start; modular chassis; belt T/D; M/R blades not included; 3D
No	7	$269.95	Hex start; modular chassis; belt T/D; finished M/R blades; 3D
No	6.4	$399.99	Hex start; 2-belt drive train; modular chassis; belt T/D; standard or CCPM control system; finished M/R blades; 3D
O.S. .32 SX-H	6.4	$599.99	Hex start; 2-belt drive train; modular chassis; belt T/D; standard or CCPM control system; finished M/R blades; 3D
O.S. .32 SX-H	6.17	$599.99	Cone start; modular chassis design; wire T/D; finished M/R blades
O.S. .32 SX-H	6.34	$699.99	Cone start; modular chassis; wire T/D; finished M/R blades; pull/pull linkages; 3D
PRO-.36H	6.2	$459.99	Hex start; modular chassis; belt T/D; finished M/R blades; 3D
No	9.8	$699.99	Hex start; modular chassis; torque tube T/D; finished M/R blades; 3D
PRO-.70H	9.8	$869.99	Hex start; modular chassis; torque tube T/D; finished M/R blades; 3D

*FG = fiberglass *M/R = main rotor *T/D = tail drive *3D = 3D aerobatic flight capable

Century Bell 47G II ARF

Century Hawk IV 30 ARF

Kyosho Caliber 30

SAFETY FIRST!

If you don't take a few moments to make sure everything is set correctly, starting a heli engine can be an eye-opening experience. Be certain to have a firm grip on the rotor head; if the engine starts at full speed, the main rotor will turn, and it could injure you or damage your heli. Here are a few tips for safe starting.

- Check and recheck the transmitter to ensure that the throttle stick is at idle and that the idle-up switches are in the off position.
- Before you start the engine, firmly grasp a blade grip to prevent the main rotor head from turning if the engine starts at a high rpm.
- Keep the transmitter within easy reach so you can quickly lower the throttle if the engine starts at high rpm.
- Position the heli in front of you so that the fuel line faces you; this way, you can disconnect it from the carburetor if you need to quickly stop the engine.
- If you carry the heli while the engine is running, hold the throttle stick at idle with your left thumb to prevent accidental stick movement. As an added safety measure, it's also a good idea to engage the throttle hold.

When you start an RC helicopter, follow all safety precautions. Before you engage the starter, make sure that the throttle stick is in the idle position and that all idle-up switches are in the off position. Keep the transmitter close by and firmly grasp a main rotor grip; if the engine starts at a high rpm, you'll be able to quickly shut it down and prevent the rotor from turning.

After the engine starts, carry the heli to your flying area by firmly holding on to a blade grip, and hook your left thumb over the throttle stick to prevent accidental movement. It's also a good idea to engage the throttle hold while carrying any helicopter if the engine is running.

BAD VIBES

To keep your RC helicopter properly tuned, it's important to reduce vibration; but no matter how hard you try, you won't be able to completely eliminate it. There are two frequencies of heli vibration: low and high. The frequency of the vibration indicates its source. For example, if the entire helicopter shakes (indicating a low-frequency vibration), the culprit may be the main rotor system. There are many things to look for within the rotor system; the blades might be out of balance, or the main shaft might be loose or slightly bent. High-frequency vibration occurs when the tail fins buzz or the rear edges of the canopy blur. Any part that turns at high rpm, such as the engine or tail-rotor system, can be the cause. You can minimize vibration by properly assembling and balancing the engine, clutch and cooling fan. So take a close look at your heli while it's hovering; if it shakes or buzzes, it's telling you that something needs to be balanced!

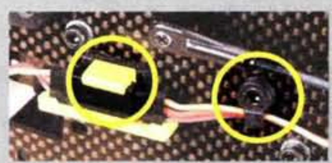
click trip MODELAIRPLANENEWS.COM LEARN HOW TO ASSEMBLE A HELI DRIVE SYSTEM

NEATNESS COUNTS

Helicopters have many moving parts and sharp edges that can catch or cut servo leads. Neatly secure the leads to each other with nylon ties and anchor them to the heli's frame to keep them in place and prevent them from being damaged. Also, separately wrap the receiver battery pack and any other sensitive electronic component in foam rubber and secure them to the radio tray with rubber bands or strips of hook-and-loop fastener. I prefer to snake the antenna through some new fuel-line tubing, secure it under the chassis (away from other radio components and the muffler) and stretch it out to the vertical or horizontal fin. You could also do away with the long antenna wire by using a base-loaded antenna.

I use foam padding and rubber bands to secure the components in place. To protect the receiver antenna, slide it through a length of new fuel tubing and route it to the rear of the heli.

Many modelers often overlook the need to secure the servo-lead extensions and the battery plug to the switch harness so they don't become disconnected. Be sure to secure the plugs; I've seen batteries come unplugged in flight with disastrous results. Use dental floss, tape, or heat-shrink tubing to hold them together. I like to use Parsons Safety Clips; they're easy to use, inexpensive, and they'll never allow a plug to accidentally become unfastened. ✈



Parsons Products Radio Plug Safety Clips ensure that wires don't become disconnected during flight; they're cheap insurance. I also use Miniature Aircraft wire keepers to route servo leads; they just slip over the head of a 3mm bolt.

Altech/MRC *(732) 225-2100; modelrc.com.*
Ace Hobby Distributors *(800) 322-7121; acehobby.com.*
Airtronics *(714) 978-1895; airtronics.net.*
Century Helicopter Products *(408) 942-9525; centuryheli.com.*
Dave Brown Products *(513) 738-1576; dbproducts.com.*
Enya; *distributed by Altech/MRC.*
Great Planes Model Distributors Co. *(800) 637-7660; greatplanes.com.*
Heli Max; *distributed by Great Planes.*
Hirobo Helicopters; *distributed by Altec/MRC.*
Horizon Hobby Inc. *(800) 338-4639; horizonhobby.com.*
JR; *distributed by Horizon Hobby Inc.*
KSJ; *distributed by Horizon Hobby Inc.*
Kyosho; *distributed by Great Planes.*
Miniature Aircraft USA *(407) 292-4267; x-cellrchelicopters.com.*
MonoKote; *distributed by Great Planes.*
O.S.; *distributed by Great Planes.*
Parsons Products Inc.; *distributed by Venture Hobbies; venturehobbies.com.*
Revolution; *distributed by Horizon Hobby Inc.*
Robart Mfg., Inc., *(630) 584-7616; robart.com.*
SuperTigre; *distributed by Great Planes.*
Thunder Tiger; *distributed by Ace Hobby Distributors.*
Webra; *distributed by Horizon Hobby.*
Whiteman Intl. *(505) 864-1107; enchangeling.com.*

Midget racing magic

SPECIFICATIONS

MODEL: Shoestring Racer ARF

MANUFACTURER: Great Planes

TYPE: sport-scale racer

WINGSPAN: 61.5 in.

LENGTH: 53 in.

WING AREA: 713 sq. in.

WEIGHT: 7 lb., 2 oz.

WING LOADING: 22.6 oz./sq. ft.

ENGINE REQ'D: .61 2-stroke or .91 4-stroke

ENGINE USED: O.S. .61 FX

FUEL USED: Cool Power 15% nitro

RADIO REQ'D: 4-channel with 5 servos (ailerons [2], elevator, rudder, throttle)

RADIO USED: Futaba 9CAP 9

PROP USED: APC 12x6

PRICE: $249.99

FEATURES: the Shoestring comes with the fuselage, wing panels and horizontal and vertical stabilizers built and covered with MonoKote. The kit includes: painted one-piece fiberglass cowl and wheel pants; heavy-duty painted aluminum landing gear; decals; wheels; fuel tank; painted canopy; all the necessary hardware and a photo-illustrated instruction manual.

COMMENTS: this is a great-looking model of a classic midget racer. It can easily be assembled in weekend, and its design allows excellent access to the radio compartment. The model's flight is solid, smooth and predictable, and it makes a great Sunday flyer.

HITS
- Nicely constructed.
- Easy to build.
- Fun to fly.
- Easily accessed interior.
- Lots of scale appeal.

MISSES
- Fuselage decals are difficult to apply.
- Wheel pants crack easily.

by Rick Bell

Great Planes Shoestring ARF

With its streamlined fuselage and pronounced cheek cowls, the Shoestring is probably the best-known midget racer. Designed by Rodney Kreimendahl and first flown in 1949, the diminutive racer was destined to become a classic in racing circles. The Great Planes Shoestring ARF is a ¼-scale replica of the famous plane, and its construction and flight capabilities capture the excitement of this sleek racer. By the way, the Shoestring's original race colors were Cadillac Chartreuse and Chinese Red.

WHAT'S IN THE BOX

The model is constructed of balsa and ply and comes covered in Cub Yellow and Missile Red MonoKote. The kit includes hinges, wheels, two-piece aluminum landing gear, an adjustable engine mount, beautifully painted fiberglass cowl and wheel pants, fuel tank, spinner, decals, painted teardrop canopy, complete hardware package and photo-illustrated instruction manual. The built-up fuselage is true to scale, and stringer details are evident under the covering.

The major parts come individually wrapped in plastic bags, and I was pleased to see that there were hardly any wrinkles in the covering. The manual is chock-full of photos and tips to help you build the model quickly.

ASSEMBLY

Assembly starts with the wing. I cut the CA hinges out of the supplied strip of material and then attached the ailerons to the wing halves. After removing the covering over the two aileron servo openings, I installed two Futaba S3003 servos, the control horns and the linkages. The manual suggests that you use two no. 2, ½-inch wood screws to attach the horns to the ailerons. I felt uncomfortable with this arrangement (given the potential speeds of the model), so I replaced them with 1-inch-long 2-56 bolts that go all the way through the ailerons and into a nylon backing plate on top of them.

The next step in the manual is to join the wing panels. I removed excess covering material from the root ribs and test-fit the hardwood joiner into the wing panels; the fit was perfect. Using 30-minute epoxy, I liberally coated the joiner and the root ribs and slid everything together. When the epoxy had cured, I mounted the wing on the fuselage and encountered no problems.

PHOTOS BY WALTER SIDAS

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

The Shoestring tracks very well on the ground and requires hardly any rudder correction to maintain a straight ground run. You need to hold a little up-elevator as you apply power, as the tail

comes up quickly. With the forward placement of the landing gear, the Shoestring doesn't show any nose-over tendencies, even on a thick grass runway. Once airborne, the climb rate is aggressive with the O.S. .61 FX, and the model is rock steady.

Landings are beautiful, as the model has a very predictable sink rate, and despite its clean racing lines, it slows down well. I set up landings by reducing the throttle to ½ on the downwind leg; this allows the model to start slowing down. As I turn on to final, I apply elevator to further slow the model, and I use throttle to maintain the glide slope. As soon as it is over the end of the runway, I cut the throttle to idle and it settles nicely on the ground. Wheeled landings are too easy and look great on rollout.

LOW-SPEED PERFORMANCE

The Shoestring handles very well at slow speeds. During induced stalls, it didn't show any tendency to snap. The model's looks are deceiving: it has a lot of wing area and that keeps it stable during low-speed maneuvers.

HIGH-SPEED PERFORMANCE

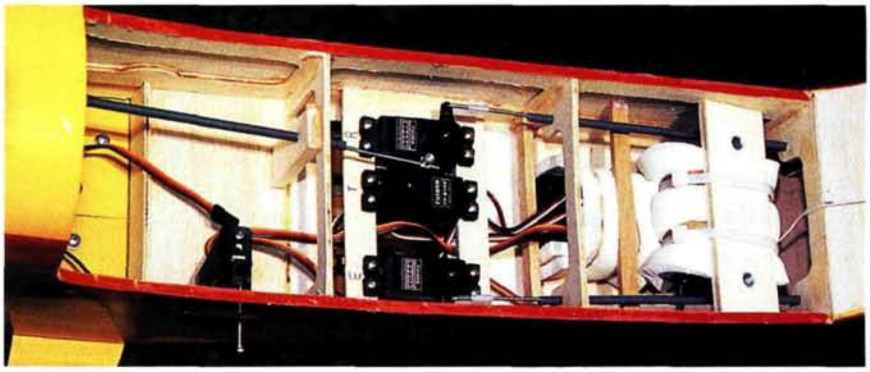
What can I say other than "Great"! The model's racing design is evident at high speeds. Handling is razor-sharp and precise. I did find that the recommended high-rate control throws for elevator and aileron were a bit sensitive, but the low rates were perfect for high-speed maneuvers. I have a lot of fun buzzing the runway at full throttle and cranking the model into high-speed pylon-racing turns as it passes by.

AEROBATICS

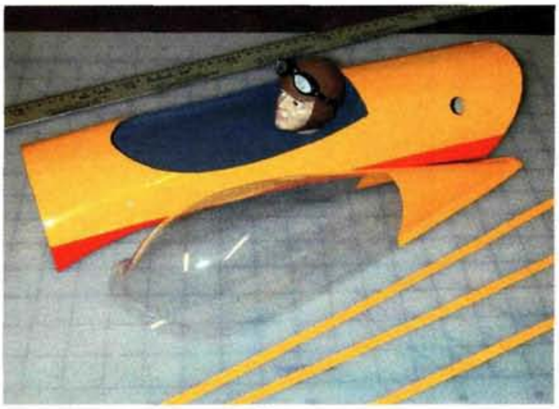
Though the Shoestring isn't designed for aerobatics, it has all of the right attributes to perform them: generous wing area, long tail moment and a favorable wing loading all combine to make it very aerobatic. Its smooth, predictable flight characteristics make graceful aerobatics easy. Rolls are very axial; loops can be as large as you want them; and inverted flight requires just a touch of down-elevator. With its generous fuselage area, the Shoestring does knife-edge flight very well; there's very little pitch coupling when rudder is applied.

If you want a great Sunday flyer that's sharp-looking and a ball to fly, the Great Planes Shoestring racer is hard to beat.

To align the decals on the wing properly, I used strips of masking tape. Doing that allowed me to keep them straight and spaced correctly.



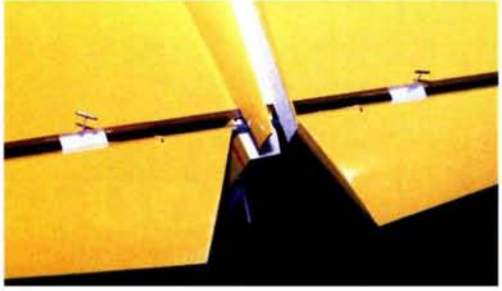
There's ample room in the radio compartment. Note that the receiver and battery are mounted behind the servos; the CG was perfect with this configuration.



To attach the canopy, I cut ⅜-inch-wide strips out of a matching MonoKote trim sheet and taped the canopy in place with them. There's no glue mess with this method. I removed the head from a pilot who was looking for a job and inserted him into a hole that I cut in the cockpit floor.

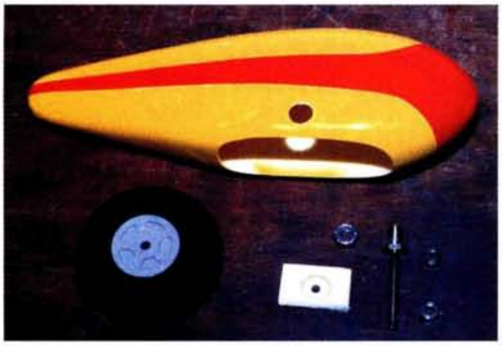
Next, mount the stabilizer and fin on the fuselage. The instructions recommend that the stabilizer be slid into the fuselage from either side, but I found it much easier to remove a piece of the fuselage tail post and to slide the stabilizer in from the rear. I then hinged the rudder and elevators to the tail feathers to complete the assembly, and I also added the tailwheel assembly. The rudder and elevators are tapered to provide a nice airfoil shape.

The wheel pants are beautifully molded of fiberglass and painted to match the covering, and I mounted them on aluminum landing-gear legs. You first need to prepare four plywood mounts by drilling 3⁄16-inch-diameter holes in two of them and ½-inch-diameter holes in the other two. Glue the mounts together with the 3⁄16-inch holes centered on the ½-inch holes. Now grab a wheel pant and mark the center of the wheel opening; using a high-speed rotary tool, cut a ½-inch-diameter hole in the pant ½ inch above the mark. Now, fit the plywood mounts into the pants and epoxy them in place (be sure they line up). I recommend that you make the plywood mounts longer to better support the wheel pant; after just a few flights, my wheel pants started to crack where the mounts ended.



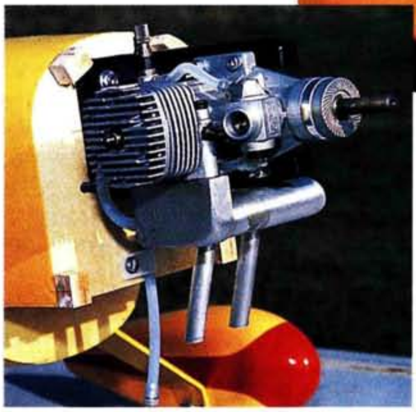
To ease the installation of the stabilizer in the fuselage, I removed part of the tail post and then glued the piece back in when the stabilizer had been secured. Note the T-pins that center the CA hinges in the control surfaces.

Above left: here, the wing is ready for the canopy assembly to be attached. Note that the covering has been removed from the wing where the canopy will contact the surface to be glued. I used the same method to remove the covering as I did on the stabilizer. Above right: instead of cutting the covering and possibly weakening the structure, I used a hot soldering iron to melt the covering. A couple of light passes are all that are needed to melt the covering, and you can then just lift it off the structure.



The wheel pants are easy to assemble. Here, the left pant is ready to have the mount glued into it. You need to cut the necessary holes in it. I recommend that you make the plywood mount longer to further strengthen the pant.

The one-piece cowl completely hides the O.S. .61 FX and the Bisson muffler. The only openings needed are for the needle valve and the glow igniter. You also need to cut an opening in the bottom of the cowl for the exhaust and cooling air to escape.



Engine installation is simple, and the Bisson Pitts-style muffler is a perfect match for the Shoestring. It's completely concealed inside the cowl, and only the tips of the exhaust stacks exit the cowl. I use a three-line fuel system; it's trouble-free and easy to use.

The rest of the assembly goes smoothly; just follow the instructions. Also be sure to mount the left gear leg on the left side of the fuselage and the right on the right side. The gear has a slight forward rake to it; there's mention of this in the instructions.

I then added a pilot to the cockpit and trimmed the teardrop-shaped canopy. Because of its teardrop shape and the shape of the surrounding cockpit, the canopy can be challenging to attach. Mine needed some gentle "massaging" with a heat gun to make it conform properly, and I used strips of trim tape to attach it. Then I mounted the cockpit assembly on the wing, and this went on easily.

To power the Shoestring, I use an O.S. .61 FX and the recommended Bisson Pitts muffler (no. 04061). This combination fits completely inside the cowl and preserves the front end's scale outline.

The manual gives instructions for measuring and drilling holes to attach the engine mount; on my kit, the folks at the factory had completed all of this. Following the manual, I mounted the engine and the striking one-piece cowl. I had to shorten the exhaust stacks on the muffler to make it easier to install and remove the cowl. The Shoestring was already looking good!

The fuel tank, servos, receiver, battery and pushrods are now installed as directed, and this went quickly and easily. Next came the decals, and they really dress up the model. I did encounter some difficulties, though, with the race numbers that go on the rear of the fuselage. The decals don't have any "give," and this made it difficult to apply them smoothly over the fuselage curves. Last, I set up the control throws as recommended and balanced the model using my Great Planes CG Machine. The center of gravity was right on; no additional weight was needed.

FINAL THOUGHTS

The Great Planes Shoestring is a high-quality ARF model of a popular homebuilt midget racer. I thoroughly enjoyed building it and have even more fun flying it; its striking looks draw many favorable comments whenever I take it to the flightline. The Shoestring's flight characteristics are as a racer's should be—nimble, sharp and precise. If you're looking for a distinctive plane that really stands out from a crowd, the Shoestring is what you've been waiting for. ✈

***APC Propellers** (530) 661-0399; apcprop.com.*

***Bisson Mufflers** (705) 389-1156.*

***Cool Power Fuel** a product of Morgan Fuel (800) 633-7556; morganfuel.com.*

***Futaba Radios** distributed by Great Planes; futaba-rc.com.*

***Great Planes** (800) 637-7660; greatplanes.com.*

***O.S. Engines** distributed by Great Planes.*

FLIGHT **TEST**

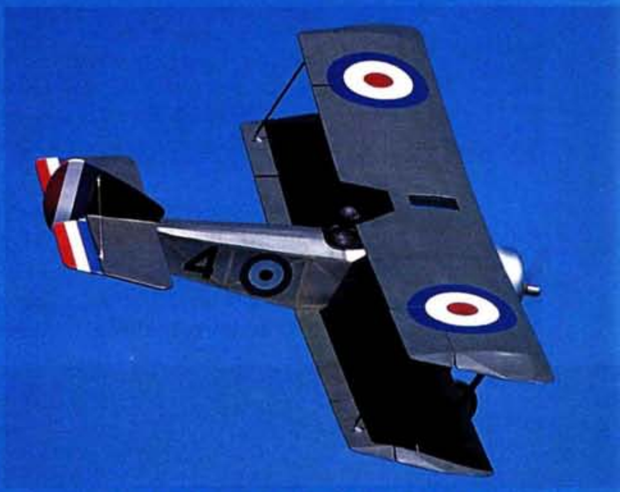
A famous WW I fighter in ¼ scale

Balsa USA
Sopwith Pup

by Jim Onorato

In 1916, the Sopwith Aviation Co. Ltd. completed the prototype of a single-seat fighting scout, designed by Herbert Smith. This new plane bore a striking resemblance to the two-seater Strutter (also designed by Smith), but it was appreciably smaller and was powered by an 80hp rotary engine. It was a military version of a single seater that had been built in 1915 as a personal transport and aerobatic

aircraft for Harry Hawker, the Sopwith Co.'s test pilot. The pilots who flew this aircraft apparently looked upon it as an offspring of the Strutter, and they nicknamed it the "Pup." Although authorities tried to persuade everyone to use "Sopwith Type 9901" as the official name, the most famous fighter and best flying airplane of WW I will always be remembered as "the Sopwith Pup."



SPECIFICATIONS

MODEL: ¼-scale Sopwith Pup

MANUFACTURER: Balsa USA

TYPE: biplane

WINGSPAN: 77 in.

WING AREA: 1,985 sq. in.

WEIGHT: 15 lb., 6 oz.

WING LOADING: 17.8 oz./sq. ft.

LENGTH: 42.5 in.

RADIO REQ'D: 4-channel w/5 servos

RADIO USED: Futaba 7-channel radio with three FMA S355M servos (ailerons and elevator) and two S301 servos (rudder and throttle)

ENGINE REQ'D: .90 to 1.20 4-stroke or G-23 gasoline

ENGINE USED: Saito FA-170R3 3-cylinder 4-stroke

PROP: 18x5 Zinger

FUEL: 15% Red Max

PRICE: $189.95

FEATURES: full-size rolled plan; prebent landing gear and cabane wires; 31-page, photo-illustrated instructions; hardware pack; die-cut parts; aircraft plywood, hardwoods and AAA-grade balsa; ABS cowl included; optional aluminum cowl available.

COMMENTS: the overall appearance and outstanding flight performance of the Pup are well worth the time it takes to build. It is well engineered to build true, and it makes a great Sunday flyer.

HITS
- High-quality materials and substantial hardware package.
- Excellent photo-illustrated, step-by-step instruction manual.
- Realistic, scale flight performance.

MISSES
- None.

FLIGHT PERFORMANCE

I fired up the Saito using the onboard glow driver and an electric starter, and I ran it up and down a few times to make sure I was getting a smooth transition and a reliable idle. When I was sure that there were no problems, I performed a range check of the radio and made sure that all of the controls were working properly.

TAKEOFF AND LANDING

On that first flight, I held a little up-elevator while taxiing to prevent the Pup from nosing over, but it proved to be unnecessary. Thanks to the big wheels, the Pup has no tendency to nose over, and it handles very well on the ground. Even with the tailskid, the Pup maneuvers quite well. Holding a little up-elevator, I begin takeoff rolls by slowly adding power while reducing the up-elevator. Tracking is good, and right rudder is not required to keep it going straight. On the first flight, the tail came up rather quickly, so I let the Pup accelerate on the main gear. When flying speed is attained, the Pup rises smoothly into the air with the wings perfectly level. It's always a beautiful, scale-like takeoff.

Landings are just as easy. Once on final, I just let the Pup descend slowly, and I use the throttle to maintain the rate of descent until it touches down for nice wheel landings. The only problem was the Pup's tendency to bounce when I set it down too hard. I added a crosspiece between the wheels to stiffen up the landing gear and take out some of the bounce; this worked just fine.

LOW-SPEED PERFORMANCE

The Pup is smooth and predictable at low speed. It has a very low stall speed, and its stalls are gentle and straight-ahead. I was pleasantly surprised to see how well it flies at low speed. I have the most fun just putting around the sky to see how slow and scale-like it can fly. The Pup is one of the most realistic-looking models I have ever flown.

HIGH-SPEED PERFORMANCE

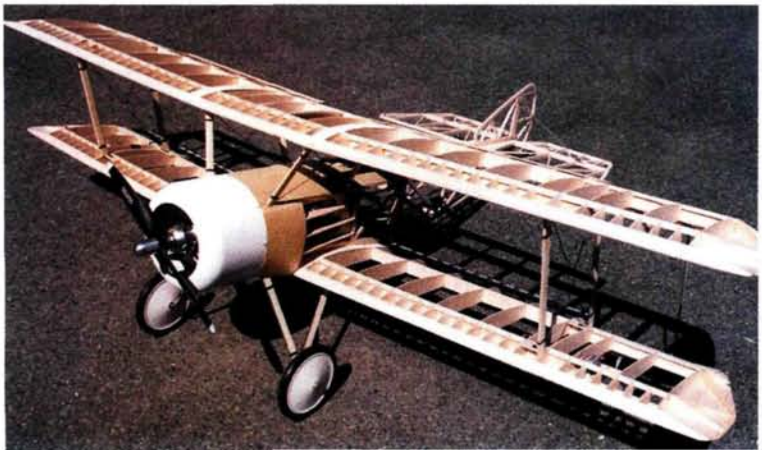
As I mentioned previously, the Pup's flight is very scale-like, and even at full throttle, it does not fly very fast. It is a smooth and stable flyer that handles well at all speeds. If I had to quantify its performance, I would say that the Pup flies slightly faster than scale at full throttle.

AEROBATICS

The Pup performs mild aerobatics consistent with its design and does them in scale-like fashion. Large loops, barrel rolls and stall turns can all be done with ease, and it performs spins as only a bipe can.

THE KIT

Balsa USA's ¼-scale Sopwith Pup kit uses conventional built-up construction with aircraft-grade plywood, lite-ply, balsa, hardwoods and plastic. The kit contains a very substantial hardware package and a 31-page, photo-illustrated construction manual with detailed, step-by-step building instructions. The manual is very well done and includes numerous photos to guide you through the building process. Other items provided include four sheets of rolled plans, prebent landing gear, cabane strut wires and an ABS cowl. An optional aluminum cowl is available, as are decals.

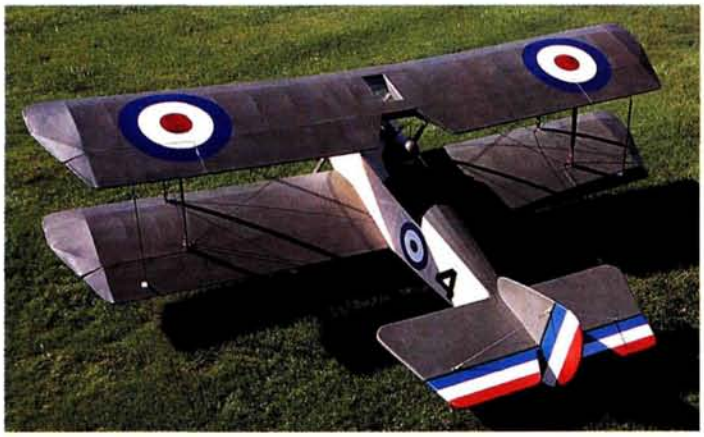


Here sits my little Pup, ready for covering. A combination of materials eventually gave the model its realistic scale finish.

CONSTRUCTION

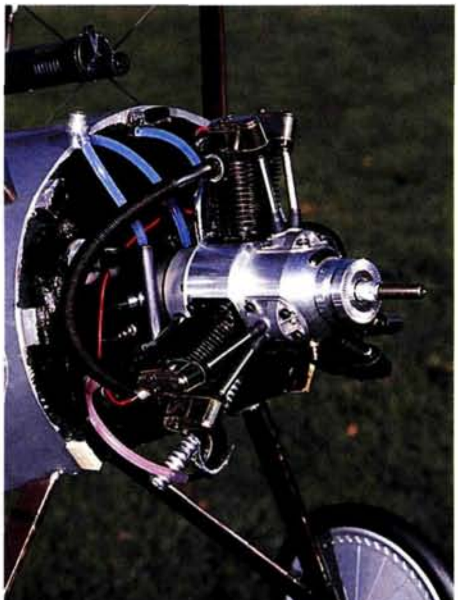
I used Balsa USA thin and gap-filling CAs for most of the balsa construction and Great Planes Epoxy on the plywood.

• **Wings.** As with any biplane, most of the building revolves around the wings, so this seemed like a logical place to begin construction. The upper and lower wings are built directly over the plan. The building process for both wings is quite similar; the main difference is in the center sections. The lower wing has a short center section and 8-bay end panels, while the



upper wing has a longer center section and 7-bay end panels. When completed, they both have 77-inch wingspans.

The lower wing houses two aileron servos that control the ailerons in both wings. The wings have four balsa spars. The two forward spars are 1/4x3/8-inch balsa, and the rear spars are 1/4-inch-square balsa. Shear webs are used between both front and rear spars. The die-cut ribs are 3/32-inch balsa, as are the false ribs. These, by the way, really give the wings a great scale look when they're covered. Ailerons should be built directly over the plan at the same time as the wing panels. The wingtips are built up and should be added before you remove the panels from the building board. Wing-strut mounting pads and aileron connector pads are made of 1/8-inch aircraft plywood. The center section of the lower wing is sheeted with 3/32-inch balsa, but do not add the bottom sheeting until after the wing has been mounted on the fuselage.



The Saito FA-170R3 radial engine both looks and sounds extremely realistic. It also produces a nice, scale flight performance. This engine matches the Pup perfectly.

• **Fuselage.** The fuselage is built up with 1/4x3/8-inch balsa stringers and 1/8-inch lite-ply formers and doublers. After building the two sides directly over the plan, I removed them and glued them to the 1/8-inch lite-ply forward top crutch that was pinned over the top view. The addition of the formers and 1/4x3/8-inch-balsa crosspieces completed the basic fuselage "box."

Before I proceeded any further, I added 1/4x3/8-inch-balsa diagonal braces to the bottom of the fuselage to add a little torsional rigidity. A note of caution here: before you install the firewall, measure the length of the engine, the engine mount and the cowl that you plan to use to see whether the firewall must be recessed. The optional scale aluminum cowl that I used was shorter than the plastic one that's provided, so I had to recess the firewall about 3/4 inch to prevent the engine's thrust washer from sticking out too far beyond the cowl. As a matter of fact, I initially set up the Pup with the included ABS cowl and had to recess the firewall after I had decided to use the aluminum cowl. If you use the longer cowl, you can always use spacers to move the engine forward if necessary.

With the fuselage upside-down on the building board, I put the lower wing in place and made sure it was square to the fuselage and that both tips were the same distance off the board. When I was satisfied with the fit, I installed the wing hold-down bolts and dowels. Then, I installed the two basswood landing-gear mounting blocks—one in the wing and the other in the bottom of the fuselage just behind the firewall. The two landing-gear blocks are not the same, so make sure that you install the one with the narrower groove in the lower wing. Next, I removed the wing from the fuselage and sheeted the bottom of the wing center section and the bottom of the fuselage behind the firewall.

The forward section of the fuselage is round on the top and sides, and die-cut

Die-cut formers, fairings and balsa stringers helped to produce the round top and sides required for the forward section of the fuselage.

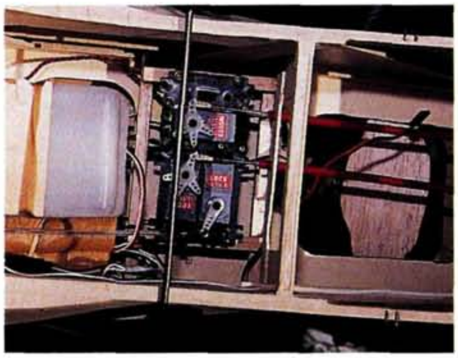
formers, fairings and 1/4-inch-balsa stringers are used to develop the proper shape. The two basswood cabane-mounting blocks should also be installed at this time. The forward deck and the side panels between the firewall and the first former are covered with 1/32-inch plywood. I attached these with USA Gold thick CA from Balsa USA, following the procedure described in the instruction manual.

The landing-gear wires come already bent and need only to be wrapped and soldered. I made up the landing-gear fairings with the grooved spruce strips provided in the kit and attached them with CA. I then wrapped them in several places with heavy nylon cord. Be careful not to waste any of the grooved fairing material, as there is just enough to do the job. The plan shows a simple wire tailskid, but for a more scale look, I made a spring-loaded wooden one.

To produce a more scale appearance, I added this spring-loaded wooden tailskid in place of the simple wire tailskid supplied with the kit.

• **Tail feathers.** Construction of the tail feathers is conventional and straightforward. Build up the fin and rudder using 1/4-inch-balsa stripwood and 1/8-inch, laminated, die-cut parts to form the outline. Build up the stab and elevator with 3/8-inch balsa stripwood with diagonal bracing cut from 3/16-inch-square balsa. The diagonals have to be shimmed with 3/32-inch-scrap balsa so they end up centered between the thicker leading and trailing edges.

• **Cabane struts, N-struts and wing setup.** The most challenging aspect of building the Sopwith Pup is the fabrication of the cabane struts and N-struts and the setup of the wings. This has to be done very carefully to ensure that the wings are mounted properly. Fortunately, the instructions cover these steps very well, and if you follow them precisely, everything will come out OK. The cabane wires are bent, but the X-braces and N-struts must be bent to fit, and then wrapped and soldered. Spruce fairings have to be added after all the soldering has been completed. There is a lot to do here, but the result is well worth the effort.



As you can see, I had no problem fitting the battery, fuel tank and all of the radio gear in the space provided. There was more than enough room.

• **Radio and engine installation.** I used a 7-channel Futaba radio (minimum 4-channel required) and five FMA servos in the Pup: three S355Ms for the ailerons and elevator and two S301s for the rudder and throttle. I installed the aileron servos in the bottom wing just in front of the ailerons and connected them to the ailerons with the 4-40 hardware provided in the kit. I connected the ailerons in the top wing to the bottom wing ailerons with wire connectors with basswood fairings. I used semi-flexible pushrods (not provided) for the rudder and elevator.

I powered the Pup with a Saito FA-170R3 3-cylinder, 4-stroke radial engine and used flexible exhaust header pipes to route the exhaust out the bottom of the cowl. The radial engine was a natural fit with the Pup, and its sound is very realistic. I also installed a JHM Aero Engineering DGS-3 On-Board Digital Glow Driver to make sure all three glow plugs stayed lit at idle. An 18x5 Zinger propeller and a 1¼-inch, B-style, Tru-Turn aluminum prop hub completed the power package.

FINISHING

I used a combination of covering materials to complete the Pup. The underside of the wings and fuselage and the fuselage sides were covered with antique white Super Coverite from Great Planes, and I used Balsa USA's olive drab Solartex on all of the upper surfaces and the fin. I covered the forward section of the fuselage with aluminum MonoKote from Great Planes, and I used red, white and blue MonoKote on the rudder and elevators. After applying the optional roundels available from Balsa USA, I sprayed the entire model with Top Flite flat, clear LustreKote. Finishing touches included the addition of rubber tubing cockpit coaming, a Williams Bros. machine gun, 6⅝-inch Williams Bros. Vintage wheels and flying wires made from elastic cord. When complete, the Sopwith Pup weighed 15 pounds, 6 ounces. This didn't surprise me, considering that I had used the radial engine and the somewhat heavy wheels. Even so, the wing loading is still less than 18 ounces per square foot.

CONCLUSION

The Balsa USA Sopwith Pup is an extremely scale-looking, scale-flying replica of one of the most famous WW I fighters. If you love biplanes and enjoy the satisfaction that comes from building a truly fine-looking airplane, you'll enjoy building and flying Balsa USA's ¼-scale Sopwith Pup. I know I'll enjoy this one for a long, long time! ✈

Balsa USA (906) 863-6421; balsausa.com.

FMA Direct (800) 343-2934; fmadirect.com.

Futaba Corp. of America distributed by Great Planes Model Distributors Co.; futaba-rc.com.

Great Planes Model Distributors Co. (800) 637-7660; greatplanes.com.

JHM Aero Engineering (770) 438-7146; jhmaeroengineering.com.

Red Max distributed by FHS Supply (800) 742-8484; members.aol.com/FHSoi/.

Saito distributed by Horizon Hobby Distributors (800) 338-4639; horizonhobby.com.

Top Flite distributed by Great Planes.

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Williams Bros. (805) 534-1307; williamsbrosinc.com.

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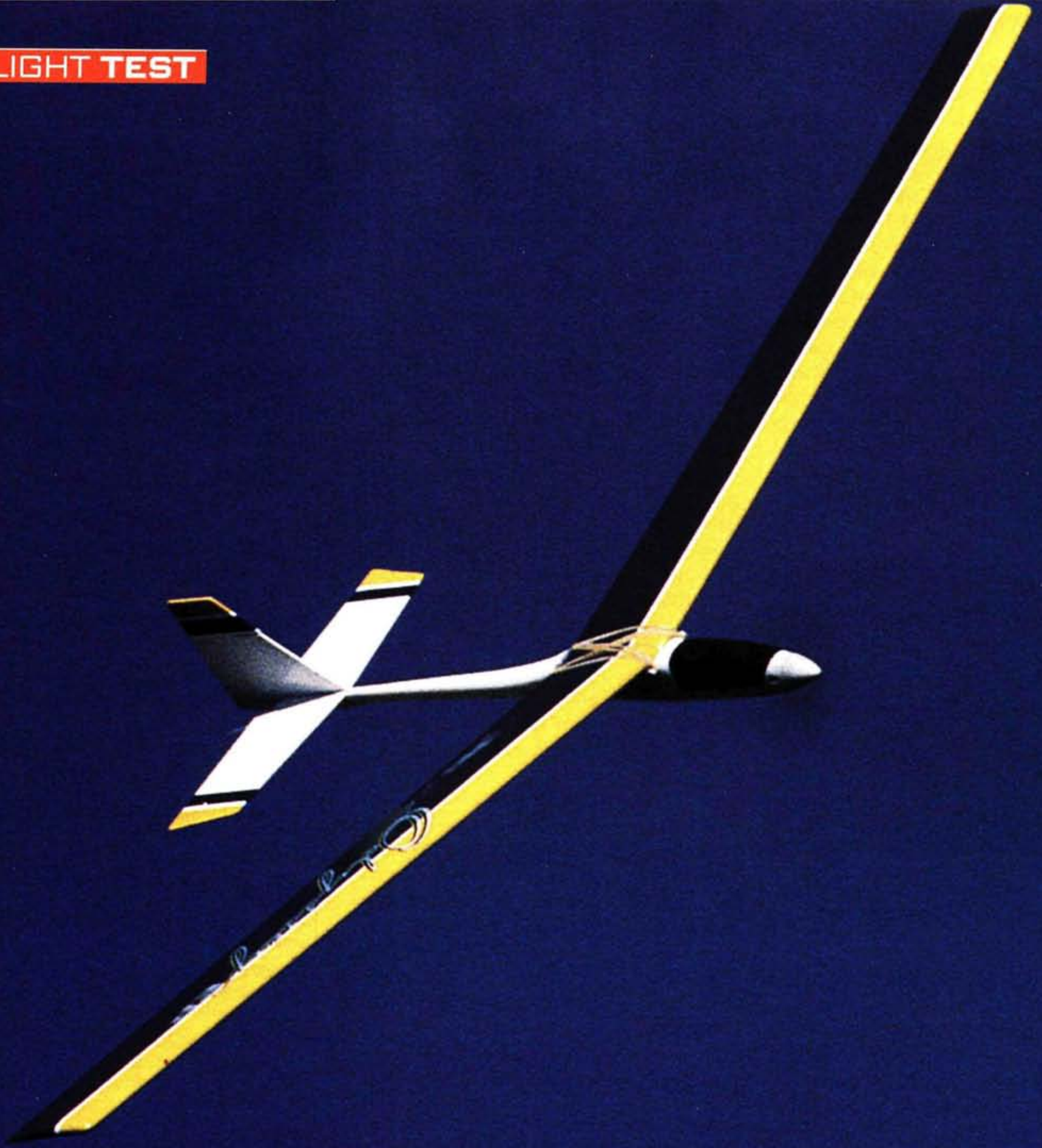


E-Flite Odyssey

Simple-to-assemble sailplane

by Richard Loud

I wish I had a dollar for every time someone told me that they really wanted to learn to fly RC airplanes, but they just didn't have the time to build one. This usually leads to a discussion about almost-ready-to-fly (ARF) aircraft and the misconception that you have to spend months building a model before you ever get a chance to fly. With its new Odyssey EP sailplane, E-Flite puts that argument to rest. For someone who has moderate RC experience, the Odyssey EP can go from the box to the flying field in about an hour. Even those with no experience whatsoever with radio control can have the Odyssey ready in an evening or two—most of which would be spent becoming familiar with the components.

WHAT'S IN THE BOX?

With the exception of the radio and batteries, everything you'll need is inside the colorful box. All told, there are seven parts (or assemblies), a decal sheet and a bag of hardware goodies. The built-up wings, fin and stabilizer are expertly covered with yellow, blue and white Solarfilm. The polypropylene fuselage comes with wing dowels, servo and battery trays and pushrods installed. The Speed 550 electric motor is prewired with a fuse, on/off microswitch, arming switch and battery connector. Of course, the motor is already installed along with the folding prop and spinner. After looking through the superbly documented manual, I realized this was going to be much easier than assembling most of my son's toys on Christmas morning.

ASSEMBLY

The word "construction" doesn't quite fit the Odyssey EP—"assembly" is more like it! Before you begin, it's a good idea to closely inspect all of the film-covered surfaces for wrinkles and warps. I found all items to be warp free, but there were quite a few wrinkles, especially on the tailpieces. I spent about 30 minutes ironing them out and was very pleased with the results.

After realizing that the first section in the manual essentially describes how to assemble the wings as I would at the flying field, I moved on to the second section, which covers the installation of the rudder- and elevator-control horns. It's pretty simple stuff, but I do have a few words of caution. The

SPECIFICATIONS

MODEL: Odyssey EP

MANUFACTURER: E-Flite

DISTRIBUTOR: Horizon Hobby Inc.

TYPE: ARF electric sailplane

WINGSPAN: 87 in.

WING AREA: 566 sq. in.

WEIGHT: 55 oz. (w/6-cell pack)

WING LOADING: 13.9 oz./sq. ft.

LENGTH: 41 in.

MOTOR: Speed 550 (included)

PROP: 8x4 folding prop (included)

RADIO REQ'D: 3-channel (rudder, elevator, throttle)

RADIO USED: Futaba 8UAF with FP-R148DF receiver, two S3003 servos, a Hitec HS-81 servo for throttle and an E-Flite Maxx 25 ESC

PRICE: $99.99

FEATURES: built-up wings covered in Solarfilm; lightweight polypropylene plastic fuselage; prewired switch harness and motor installed.

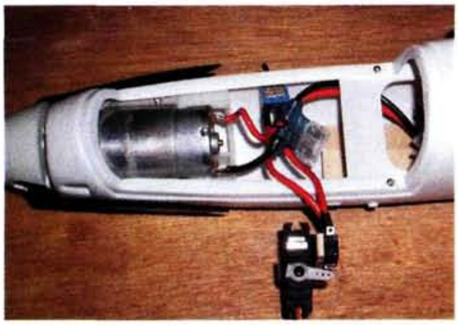
COMMENTS: this is a very complete kit, and all of its parts exhibit a high degree of craftsmanship. The Odyssey is an excellent choice for beginner and intermediate pilots who are looking for an electric, self-launching sailplane that requires minimal building time.

HITS

- Very clear and understandable manual.
- Excellent instructions on thermal soaring.

MISSES

- Wrinkled film covering.



The Odyssey comes with a microswitch prewired to the motor. The microswitch should be attached to the side of the throttle servo so that the servo arm triggers the switch when power is needed.

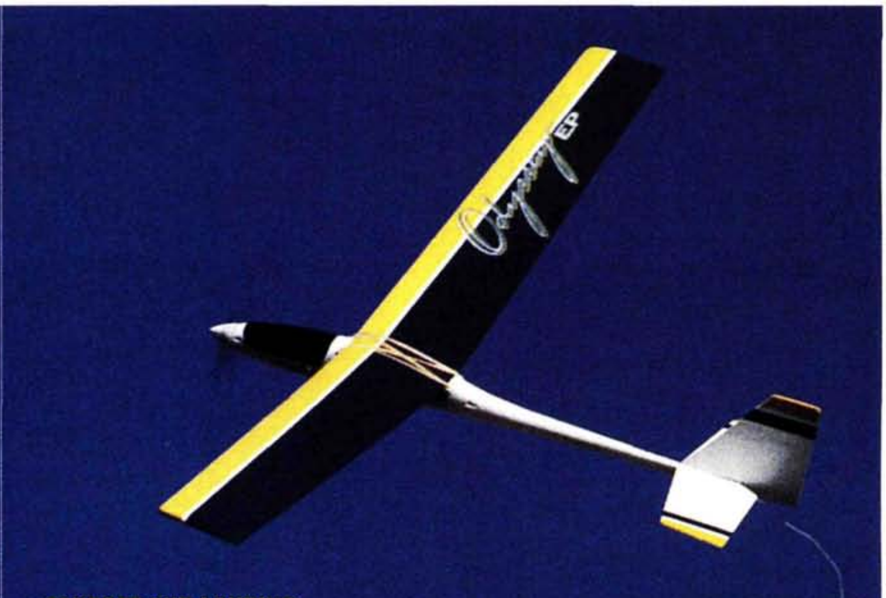
instructions don't explicitly state where to install the rudder-control horn. To avoid its binding with the elevator, you should mount the rudder-control horn as close to the bottom edge of the rudder as you possibly can.

Assemble the tailpieces by running threaded metal rods from the fin through the stabilizer and then through holes in the fuselage. Two nuts hold the whole thing together. To spread the load a little bit, I added a washer between each nut and the fuselage.

RADIO AND MOTOR INSTALLATION

The next step is to install the radio. I don't think I've ever reached this point in a model's assembly so quickly. If you've installed a radio in an airplane before, you will have no problem; in fact, it shouldn't even be a problem for a first-timer. Any basic 3- or 4-channel radio with standard-size servos and receiver will work fine. I installed Futaba S3003 servos for the rudder and elevator in the preinstalled servo tray. A plywood adapter plate is provided for microservos, if you wish to use them.

FLIGHT PERFORMANCE



TAKEOFF AND LANDING

As is typical with most powered sailplanes, the Odyssey must be launched by hand. Point it into the wind, give it a good toss, and once you've established a stable glide, gently apply power. Both battery packs provide plenty of power to climb, though you have to let the wing do the work, especially with the heavier duration pack. It won't climb on the prop alone.

Landing is a piece of cake. Simply set up Odyssey in a large pattern and allow for a long final approach. With the wings level, the Odyssey will pretty much land itself.

GENERAL FLIGHT CHARACTERISTICS

The Odyssey flies very much like most 2-meter, rudder/elevator sailplanes. The big rudder has plenty of authority. At low airspeeds, it can take a while to roll those long wings around, so it pays to think ahead. Power-off stalls are gentle and break straight ahead. Stalls at full power occur at a significant nose-high attitude and break gently to the left, especially at higher power settings. Glide performance is very good. The Odyssey easily turns tightly enough to hook even small thermals, and its long wings signal lift well.

There are two choices for the motor control. The kit includes an on/off microswitch prewired to the motor, but an electronic speed control (ESC) is available separately. For the initial test flights, I went with the microswitch, but I later chose to add the E-Flite Maxx 25 speed control. (See the sidebar, "Adding throttle control," for more information on how I did this.) Attach the microswitch to a servo with double-sided tape so that the servo arm activates the switch at full throttle. I chose to use a Hitec HS-81 microservo for the motor control, although the fuselage is roomy enough for a standard servo.

If you use the microswitch for motor control, you will need a receiver battery. I chose a 600mAh flat pack, but a comparable square receiver battery will also work. If you want to save weight on the receiver battery, you should install the ESC.

I used hook-and-loop fastener to hold the receiver, receiver battery and power battery in place. I mounted the throttle servo on the floor of the fuselage with double-sided tape.

ADDING THROTTLE CONTROL

If you'd like motor control beyond that afforded by a simple on/off switch, or if you simply want to eliminate the extra weight of the receiver battery, then you need an electronic speed control (ESC) with a battery-eliminator circuit (BEC). For the Odyssey, E-Flite recommends its Maxx 25 ESC.

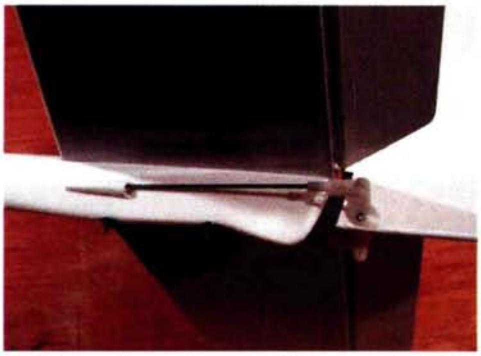
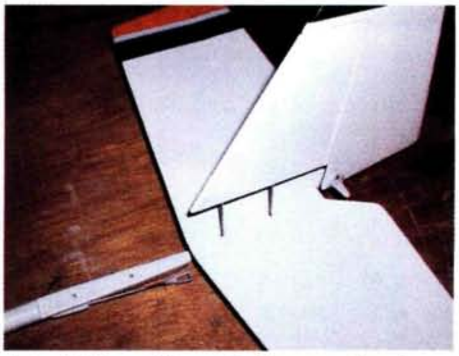
The Maxx 25 comes with male bullet connectors on the motor leads, but the Odyssey comes with microswitch wires soldered directly to the motor. Because I want to be able to interchange the ESC with other models, I unsoldered the microswitch wires from the motor and soldered on two pigtails with female bullet connectors. It's best to remove the motor from the airframe for this operation. With the pigtails in place, reinstall the motor, connect the ESC to the motor leads, and plug the control lead into the throttle slot in the receiver. All that remains is to adjust the set point on the ESC by means of a small dial. To avoid possible injury, it's best to do this with the prop removed.

To install the ESC, it's best to remove the Speed 550 motor from the fuselage. I removed the original motor leads and replaced them with pigtails and female bullet connectors.

CONCLUSION

Except for checking the Odyssey's balance and setting its control throws, the assembly was complete at this point. A quick look through the manual's last five pages gives a newcomer to the hobby a lot of good advice on learning to fly. There is also a very good explanation of thermals, including how they're formed, how to find them and how to fly in them.

The E-Flite Odyssey EP has the makings of a model that can introduce a lot of people to the thrill of radio control. With the Odyssey's good performance and an assembly time that can be measured in minutes, we may soon see more newcomers at the field looking for someone to help launch them on an RC odyssey of their own.

Left: to avoid interference with the elevator, be sure to install the rudder-control horn as close to the bottom of the rudder as you can. Right: two threaded rods that extend from the vertical fin through the fuselage hold the tail assembly in place, and two nuts hold the whole thing together. The stabilizer is sandwiched between the fin and the fuselage.

DURATION VS. THRUST

I flew the Odyssey with both a 6-cell, 2400mAh duration battery pack and a 7-cell, 800mAh high-thrust battery pack. Both packs produce good performance, but there are marked differences—most obviously, in climb performance. The higher output and lighter weight of the high-thrust pack make for a rapid rate of climb. Thermal altitude can be reached in less than 30 seconds. With its lower power output, the heavier duration pack requires you to let the wing do more of the work. It may take closer to a minute before you're ready to go thermal hunting.

The other significant difference is the duration of the motor run. The duration pack provided full-throttle power for about 5½ minutes, with motor cutoff at 6 minutes. The thrust pack gave a full-throttle run of 2½ minutes, with motor cutoff a mere 10 seconds later.

Both packs have enough capacity for four to six climbs, and considering glide time, it isn't uncommon for flights to last 8 to 12 minutes, even if the thermals aren't active.

***E-Flite** distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

***Futaba** distributed by Great Planes Model Distributors (800) 637-7660; futaba-rc.com.*

***Hitec** (858) 748-8440; hitecrcd.com.*

FLIGHT **TEST**

Lanier RC
CAP 232

Outstanding almost-ready-to-fly aerobat

by Jim Onorato

Lanier RC's CAP 232 kit proved to be a popular aerobatic aircraft, and I have no doubt that this ARF version of the model will live up to that reputation. A recent addition to Lanier's 21st Century line, this ARF aircraft is essentially the same as the kit version, although its wing is 1 inch shorter. The CAP features interlocking, laser-cut parts, plug-in, balsa-sheeted foam-core wing panels, airfoil-shaped tail feathers and painted fiberglass cowl and wheel pants.

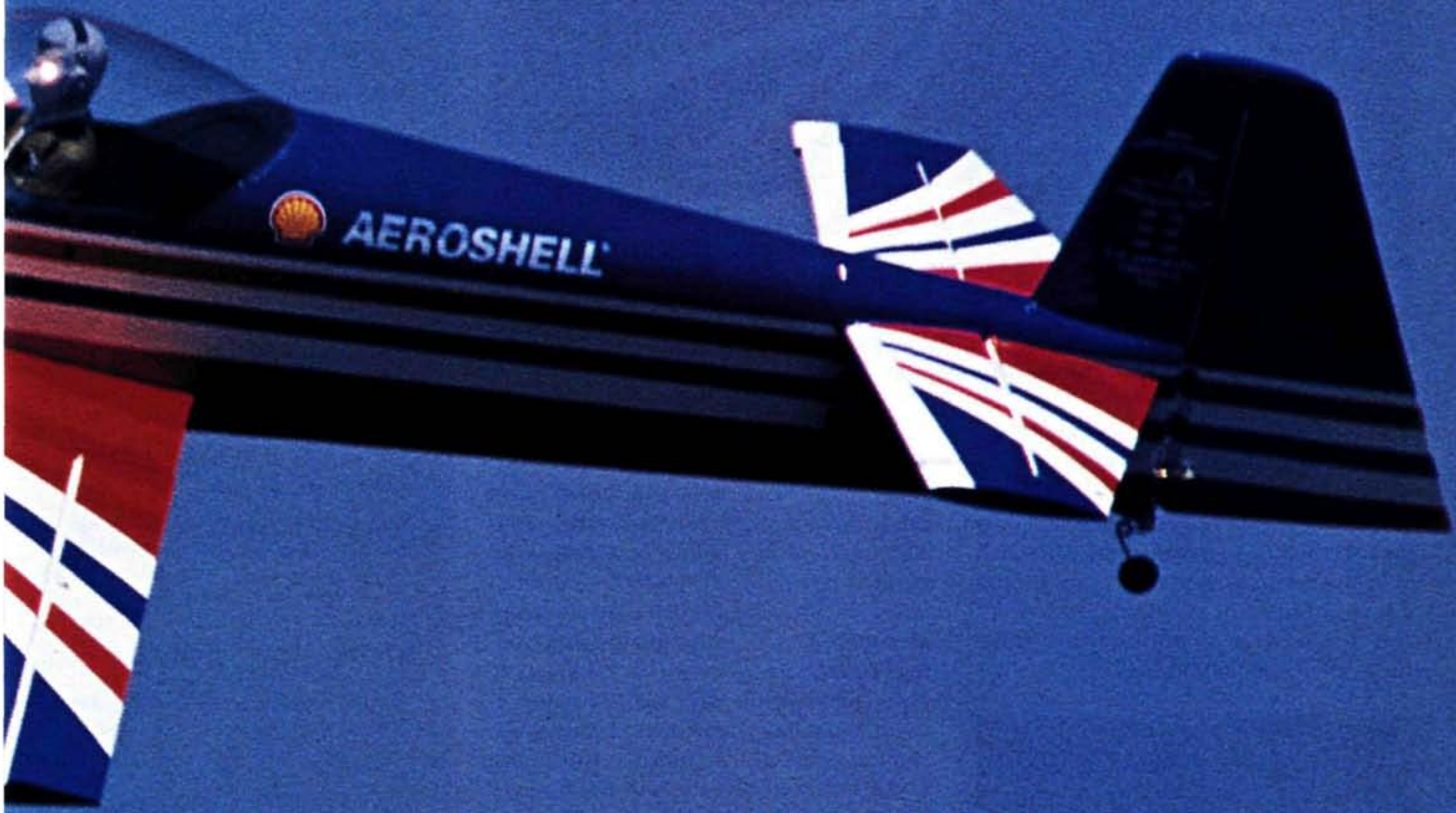
The fuselage is constructed of lite-ply with balsa-sheeted, foam-core turtledeck and forward hatch/canopy frames. The model is expertly covered with red, white and blue UltraCote and comes with high-quality hardware. All of the control surfaces are dual-beveled at the hinge line to allow maximum deflection for all those radical maneuvers. The 16-page instruction manual's step-by-step instructions and many photos guide you through the assembly. A photo of the hardware required for each major is also included at the beginning of the section dealing with that assembly. I thought this was a nice touch, and it was very helpful in identifying all of the hardware. This is a very complete kit. It looked good in the box and it looks even better when assembled.

ASSEMBLY

Before I started the assembly, I had to shrink out the wrinkles in the covering. Since there was very little overlap between the various colors of covering, I first sealed the edges with a heating iron and then used a heat gun. If you don't do this, you may end up exposing bare wood where the colors overlap.

WING PANELS

Assembly begins with the wing panels. Simply attach the ailerons and install the aileron servos (one per panel), control horns and linkages. The control horns are 6-32 pan-head



screws. They should be inserted through the hard points in the ailerons and held in place with lock washers and hex nuts. To make the length of the control horns adjustable, thread nylon horn brackets onto the screws. The ailerons and wing panels are predrilled to accept the Robart hinge points (four per aileron) provided in the kit.

The instructions suggest that you install the hinge points in the ailerons first, let the adhesive cure and then glue them into the wing. If you do this, you must be sure that all of the pivot points are properly aligned and inserted to the same depth to prevent binding. I chose a different procedure—one that guarantees proper alignment. I first applied Vaseline to the pivot points and put 30-minute Zap Z-Poxy in the predrilled holes in the wing and aileron; I also put a dab on the tips of the hinge points. I then inserted the hinge points into the wing and aileron and flexed the aileron up and down while sliding it onto the wing. This causes the hinge points to automatically rotate into perfect alignment. After the epoxy had cured, I installed two DAD Pro Flex servos and connected them to the aileron control horns with the provided linkages.

TAILPIECES

The stab was made to be removable, but Lanier recommends that you permanently glue it into place and use the added holding power of the bolt to retain it so that's exactly what I did. When the 30-minute Z-Poxy had fully cured, I attached the elevators and rudder with the provided Robart hinge points and installed them using the same procedure I used on the ailerons.

Next, I installed the tail feather. The elevators require two servos, and Lanier recommends that you use two rudder servos with the two rudder pushrods in a pull/pull setup for maximum force. All four servos are at the rear of the fuselage. I used a standard Y-connector for the rudder and a reversing Y-connector for the elevators. Of course, if you have a computer radio, you could connect the elevator servos to two different channels and eliminate the reversing Y-connector. I used two Futaba 9202 servos for the elevators and two DAD Pro Plus servos for the rudder. I had to slightly widen the servo cutouts to accept the standard-size servos. I connected all four servos using the included hardware.

Next, I assembled and installed the landing gear, wheels and wheel pants—all of which were of excellent quality. The landing

The Lanier RC CAP 232 comes with high-quality hardware.

SPECIFICATIONS

MODEL: CAP 232

MANUFACTURER: Lanier RC

TYPE: unlimited aerobatic ARF

WINGSPAN: 80 in.

WING AREA: 1,265 sq. in.

AIRFOIL: symmetrical

WEIGHT: 17 lb., 12 oz.

WING LOADING: 32.3 oz./sq. ft.

LENGTH: 79.125 in.

RADIO REQ'D: 4-channel (ailerons, rudder, elevator and throttle)

RADIO USED: Futaba 7-channel w/8 servos

ENGINE REQ'D: 1.5 to 3.2 2-stroke or 1.60 to 3.0 4-stroke

ENGINE USED: Fox 3.2 2-stroke gasoline with Slimline giant-scale Pitts-style muffler

PROP USED: 22x10 PK Max

FUEL USED: 40:1 gas/oil mixture

STREET PRICE: $420

COMMENTS: the CAP 232 is a quick build, it looks great and is extremely aerobatic. If you're looking for a big airplane that won't take forever to build, the Lanier RC CAP 232 might be for you.

FEATURES: expertly covered in red, white and blue UltraCote; plug-in, balsa-sheeted, foam-core wings; airfoil-shaped tail feathers; painted fiberglass cowl and wheel pants included; lite-ply and balsa construction; foam-core turtledeck and forward balsa-sheeted hatch/canopy; comes with complete hardware package.

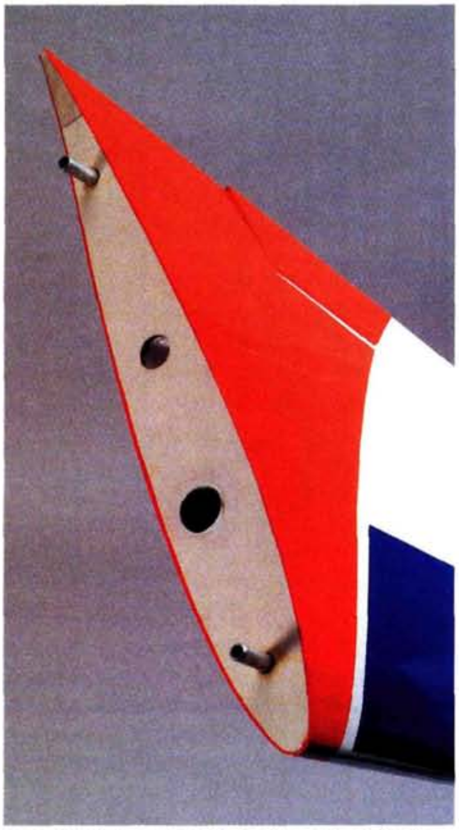
HITS

- Excellent flight performance and low-speed stability.
- High-quality American-made hardware included.
- Good overall appearance.

MISSES

- Chipped paint on cowl.

gear is heavy-duty; 3/16-inch preformed aluminum with steel axles. The wheels are Sullivan SkyLites, and the wheel pants are painted fiberglass. I attached the landing gear to the fuselage with three 1/4-20-inch steel socket-head bolts. Two aluminum angles installed in the fuselage reinforce the landing-gear mounting plate. These made a very solid installation.


The aluminum antirotation pins set and maintain the proper wing incidence.

ENGINE INSTALLATION

After I measured the lengths of the cowl and engine, I determined the location of the firewall and glued it into place with 30-minute epoxy. I pinned both sides with 1/16-inch dowels in three places and reinforced the firewall joints with 1/2-inch triangle stock. Lanier recommends that you install a 1.5 to 3.2 2-cycle or a 1.6 to 3.0 4-cycle engine in the CAP 232. I installed a Fox 3.2 gasoline engine with a giant-scale Slimline muffler. I mounted it with four, 10-32 socket-head bolts and blind nuts. I mounted the ignition module and battery on the engine box behind the firewall along with a servo-operated kill switch. I also installed a manual kill switch in the cowl.

The paint on the fiberglass cowl I received was blistered and chipped, but Lanier promptly sent me a new one that was fine in all respects. The cowl has a 1/4-inch-plywood cowl ring with four mounting lugs that match the lugs on the front of the fuselage. Four 6-32 socket-head bolts and blind nuts hold it in place. Because the bolts are recessed, all you see are four small holes in the side of the cowl when it's in place. This is really neat! I used a Dremel tool to cut out an opening in the bottom of the cowl for the engine head and muffler, making sure that it was large enough for proper cooling. To ease installation and removal of the cowl, I cut the muffler exhaust pipes short enough to clear the cowl ring at the back edge of the cowl when it passes by them. Once the cowl was installed, I mounted a 3-inch piece of 1/2-inch-i.d. silicone tubing on each pipe.

The canopy frame extends to the cowl and is removable for easy access to the fuselage's interior. I painted the inside of the cockpit with flat black acrylic paint and installed a 1/4-scale Hangar 9 civilian pilot figure and Small Aircraft Components detailed instrument panel before attaching the clear canopy.

RADIO AND WING INSTALLATION

I next installed the supplied 24-ounce fuel tank and two FMA S-301 servos (throttle and kill switch) behind the motor box in the fuselage. To achieve proper balance, I

FLIGHT PERFORMANCE

The first flight took place on a beautiful sunny day with a light breeze blowing straight down the runway. I set up my transmitter so that high rate gave the control surface throws recommended in the instructions, and low rate gave 70 percent of those values. I used low rate for the initial takeoff.

TAKEOFF AND LANDING

On takeoff, the tail lifts almost immediately, and the CAP tracks straight ahead with only slight right rudder. I let it roll about 100 feet and then apply just a touch of up-elevator. The CAP lifts smoothly into the air with the wings perfectly level. Just a few clicks of down-elevator and left aileron trim are all that were needed for straight and level, hands-off flight.

Landings are also very easy. I gradually cut the throttle while on base leg and reduce it to idle on final. With the Fox at idle, the CAP loses altitude at a reasonable rate, and once over the edge of the runway, it settles in for beautiful wheel landings and smooth rollouts. Occasionally, I add a short burst of power to maintain landing speed.

LOW-SPEED PERFORMANCE

The CAP is smooth and predictable at low speed. I take it to a safe altitude and reduce the throttle while applying more and more up-elevator. The stall is gentle and straight-ahead. The plane can be flown at a very slow speed without losing stability and can execute all but vertical maneuvers at part throttle.

HIGH-SPEED PERFORMANCE

I should say "full-throttle performance" because the CAP really doesn't fly very fast, even with the Fox running wide open. It flies at a very comfortable scale speed and tracks extremely well at full throttle. It is a smooth and stable flyer at all speeds.

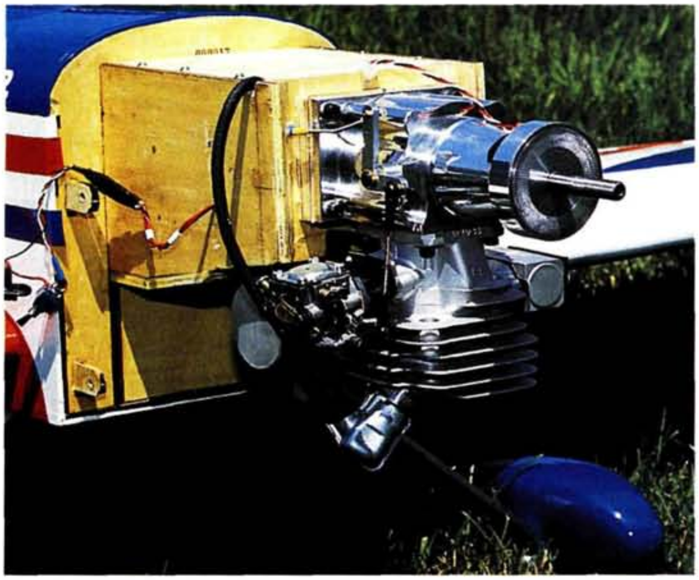
AEROBATICS

The CAP is a proven aerobatics airplane and is capable of every imaginable maneuver. I expected it to perform well, and I wasn't disappointed. Inside and outside snap rolls are beautiful—just fast enough to be appreciated. Axial rolls are fast and truly axial. Sustained knife-edge and outside 360-degree turns also aren't a problem for the CAP. Spin recovery is within ¼ spin once the controls are released. Only slight down-elevator is required to maintain level inverted flight.

While the Fox 3.2 doesn't give the CAP unlimited vertical performance, it has sufficient power to haul it straight up as far as I needed to go. Overall, I am very pleased with the performance of both the plane and the engine.

placed the receiver under the canopy and the receiver battery behind the canopy.

A design feature that I particularly liked was the use of a fiber tube permanently installed in the fuselage to accept the aluminum wing spar that holds the plug-in wing panels. This eliminates the possibility of the aluminum wing spar wearing away the holes in the fuselage sides and causing the wing panels to loosen. Each wing panel contains two aluminum antirotation pins. I made sure that they were securely glued into place and then trial-fit the panels on the aluminum spar. The holes for the pins are already drilled in the fuselage, and they set the proper wing incidence. If the pins do not let the wing seat properly, remove some wood from the front or back edge of the hole in the fuselage. Only do this if it's absolutely necessary, and do not remove wood from the top or bottom edge; this will affect the incidence. I fastened the panels to the spar with 6-32 capscrews threaded through hard points in the top of the wing.



The Fox 3.2 engine is a nice fit and provides excellent flight performance. I mounted the ignition module and battery and servo-operated kill switch in the engine box behind the firewall.

FINAL TOUCHES

Although the CAP looked mighty fine in its red, white and blue color scheme, I decided to dress it up a little with graphics from Model Graphics and several that I cut from vinyl with a Stika cutting machine. I fit the Fox engine with a 22x10 PK Max wooden prop and a beautiful 3½-inch Tru-Turn aluminum spinner.

The Lanier RC CAP 232 goes together easily, is very aerobatic and has good low-speed stability. It also looks great on the ground and in the air. I really enjoyed building and flying this airplane, and I highly recommend it for advanced fliers. If you're looking for an easy-to-build, highly aerobatic plane, this just may be the model for you. ✈

***DAD** (Design & Development Corp.), (800) 669-4548.*

***FMA Direct** (800) 343-2934; fmadirect.com.*

***Fox Mfg.** (501) 646-1656; foxmanufacturing.com.*

***Futaba Corp. of America;** distributed by Great Planes Model Distributors Co. (800) 637-7660; futaba-rc.com.*

***Hangar 9;** distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

***Model Graphics;** (409) 787-2875; modelgraphics.com.*

***PK Max;** distributed by Fox Mfg.*

***Slimline Mfg.** (480) 967-5053; slimlineproducts.com.*

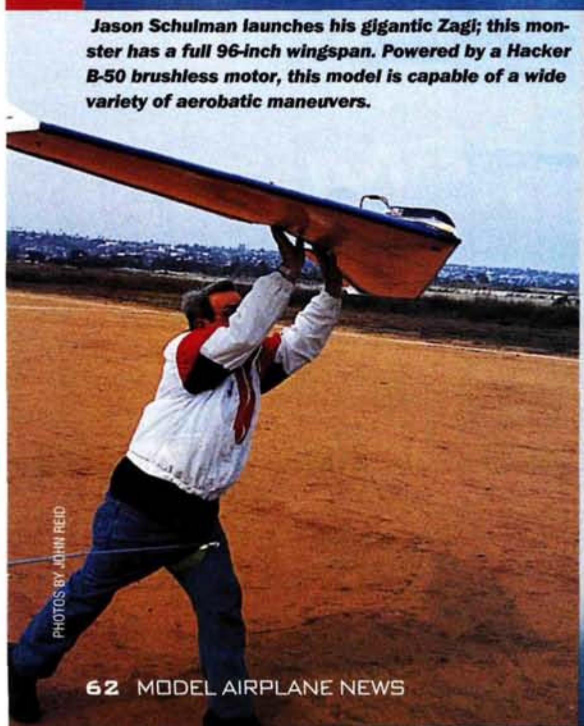
***Small Aircraft Components** distributed by Eureka RC; eureka-rc.com/US_mainframe.html.*

***Tru-Turn;** distributed by Romco Mfg., (713) 943-1867; tru-turn.com.*

***Zap Glue;** zapglue.com.*

SAN DIEGO ELECTRICS FLY-

by John Reid



Jason Schulman launches his gigantic Zagi; this monster has a full 96-inch wingspan. Powered by a Hacker B-50 brushless motor, this model is capable of a wide variety of aerobatic maneuvers.

PHOTOS BY JOHN REID

Frank Gagliardi takes first place in Class A San Diego scale (less than 50-inch wingspan) for this beautiful Eindecker E-III powered by a direct-drive Speed 600 motor. Check out the neat, scale flying wires!

Class B Open scale features an interesting mix of aircraft. One of the most notable is Geary Keilman's second-place-winning Me-323 Gigant, built from a Graupner kit and sporting six (yes, six) Speed 280 motors. There's no mistaking the sound as this plane flies by.

Who says electricity and aerobatics don't mix? Ray Fulks' Kyosho CAP 232 was originally designed for 40-size glow power, but it performs every bit as well with its HP 220-20-A3 motor, geared 5:1 on 16 cells.

Southern California E-XTRAVAGANZA

San Diego is known for its sunny, warm weather, but for four days over Presidents' Weekend (February 15 to 18) at the 2002 San Diego Mid-Winter Electrics, the skies were stormy and winds blustery. This didn't dampen the sprits of the promoters, vendors, participants and spectators who filled the flying field on Saturday; approximately 600 spectators watched 140 registered pilots compete in five events. Pilots came from as far east as New York and as far west as Hawaii.

WINNERS

PLACE	PILOT	MODEL
SATURDAY ELECTROGLIDE		
1	Pedro Brantuas	Sunbird
2	Tom DeShon	Sunbird
3	Don Wemple	Systole
SUNDAY ELECTROGLIDE		
1	Sean Plummer	Escape
2	Don Scegiel	Obsession
3	Dave Roberts	K-Rat
CLASS B OPEN SCALE		
1	Dan Savage	Scratch-built F-106
2	Geary Keilman	Graupner Me-323 Gigant
3	Ward Shelley	Scratch-built AT-6 Texan
CLASS A SAN DIEGO SCALE		
1	Frank Gagliardi	Scratch-built Eindeker E-III
2	Don Wemple	Scratch-built Nieuport 17
3	Chuck Haverlak	Scratch-built P-51 Mustang
SPEED 400 PYLON RACER		
1	Steve Neu	Stinger
LIMBO CONTEST		
1	Glen Merritt	Hitec Sky Scooter

Allen Szabo puts on a great show with his Calet Whisper aerobatic helicopter that culminated in a spectacular upside-down hovering maneuver with the rotors just inches from the ground.

The Fly-in was presented by the Silent Electric Flyers of San Diego and sponsored by Hitec and *Model Airplane News*. The West Coast's largest electric-airplane event lived up to its title despite the weather. At any given moment, the sky was teeming with four to six planes, each one with a pilot trying to impress his respective judge. The static display covered a large part of the pit area, with planes that ranged from small-scale backyard flyers to ¼ scale and beyond. Spectators lined up two and three deep to study the details of these silent flyers. A well-managed radio impound assured that there were no mishaps with radio conflicts; all aircraft made it back to display.

Twenty-eight vendors stocked the supplier booths with a wide variety of goods for the electric flier. Aero Model, Airtronics, AstroFlight, Diversity Models Aircraft, Electric Jet Factory, EMS Jomar, Hobby Club, Hobby People, K&A Models and Peak Electronics are just a few who were there.

EVENTS

Saturday opened with an electroglide contest. All the planes were launched together and flown powered by Speed 400 motors on 7 cells for 90 seconds, at which time the judge yelled, "End power!" At that point, the pilots tried to keep their planes aloft for as long as they could, without going over 20 minutes. To keep the timed points, each plane had to land on the marked runway, and if the plane stayed aloft longer than 20 minutes, no points were awarded. After three rounds, the pilot with the most accumulated time points was declared the winner. Pedro Brantuas took top honors with his Sunbird, followed by Tom DeShon (also with a Sunbird) and Don Wemple with his Systole.

The scale events followed, with five to six planes in the air at any one time. Every flyer had a judge watching its maneuvers and grading the flight for scale realism. Spectators lined the runway with cameras and camcorders while they watched many uncommon models as well as the usual favorite scale birds cut through the somewhat murky skies. With so many planes from the static display being flown, this popular event ran overtime, but no one minded.

In the open class, Dan Savage prevailed with his scratch-built F-106. The runner-up spot went to Geary Keilman and his Graupner Me-323 Gigant with six (yes, six) Speed 280 motors, followed by Ward Shelley's beautiful AT-6 Texan. The San Diego class featured planes with less than 50-inch wingspans. Frank Gagliardi topped the podium for his scratch-built Eindecker E-III powered by a direct-drive Speed 600, Don Wemple took second with his Nieuport 17, and Chuck Haverlak's P-51 Mustang took home third.

During the lunch break, numerous aerial demonstrations kept the crowd's attention. Ducted-fan jets took to the sky, using a type of launching platform that many combat pilots use. These jets flew fast without the roar of their gas-powered counterparts and landed perfectly after a few low passes.

Next were the electric helicopters. With his orange and black R/C Direct Logo 20 Mikado helicopter, Mark Mercer performed extreme aerobatics that drew gasps from the crowd. Mark stood it on its rotors in every possible position. He rolled, flipped, looped and rotated all over the sky and ended with

Greatly anticipated was the demonstration of the "world's fastest Sky Scooter" by Hitec. The show sponsor's popular little foam flyer was launched by a 30-pound bungee, accompanied by smoke effects. The plane lived up to the billing—for at least a second or two! Far right, what was left of the record-setting foamie after its momentous flight.

a deadstick autorotation from a couple of hundred feet to a perfect landing. Not to be outdone, Allen Szabo gave his own aerobatic clinic with his Calet Whisper. His stint culminated with hovering action within inches of the ground—upside-down!

The crowd waited with great anticipation for what was billed by the announcer as "the world's fastest Sky Scooter." Hitec's popular foam flyer was launched by a large bungee cord, with a 30-pound pull, at approximately 30Gs. The first launch was less than spectacular; the force from the bungee pulled the towhook out of the plane—and moved the Sky Scooter about 5 inches. The problem was rectified with an 8-inch spike nail pushed through the nose and attached to the bungee. The second launch yanked the plane into the air for just a second, and then the Sky Scooter plowed nose first into the dirt on the other side of the runway!

In pylon races with gas-powered motors, you can usually identify the fastest plane by how loud it is. Here, the Speed 400-pylon racing is fast and furious, but without a lot of noise. If I hadn't been looking at the course, I wouldn't have known when the planes were up.

Steve Neu placed first with his Stinger. All competitors used Speed 400 motors on a maximum of 7 cells, and the models weighed between 11 and 12 ounces. The race consisted of ten laps around a ½-pylon course during which some racers approached 100mph.

High winds and rain thinned out the crowd on Sunday, but the open electroglide contest concluded before the rain. Sean Plummer took first place with his Escape, just ahead of Don Scegiel's Obsession and Dave Roberts' K-Rat.

The Speed 400 electroglide contests were an exciting mix of design efficiency and pilot skill. Speed 400 motors on 7 cells powered all models, and pilots had 90 seconds under power to set themselves up for the glide competition. The pilot who kept his model aloft the longest without exceeding 20 minutes was the winner.

Despite the rain, many wanted to fly in the limbo contest, so the razor wire was strung across the runway at 6 feet, and the planes were launched. Any plane that passed under the wire was awarded 1 point; if it flew inverted—2 points. A Mylar balloon was placed just under the razor wire in the center of the runway; if any plane popped it, an additional 10 points would be awarded, but no one was able to claim those points. When the contest was over, the runway looked more like a battlefield than a landing strip. Hitec vice president Glenn Merritt survived the carnage and took first place with his Sky Scooter.

CONCLUSION

The San Diego Mid-Winter Electrics Fly-in was well organized and drew a large crowd of participants, spectators and vendors. Everyone enjoyed the show and appreciated the high quality and diversity of the models. The only problem was that with so many pilots competing, there wasn't enough flying time for individual participants, although weather was surely a factor. For next year's event, the organizers already have plans to resolve the flying-time issue. I look forward to next year's event; after all, what are the odds of rain in southern California two years in a row? ✈

Fairchild 24 Argus

A 1930s cabin plane with character

by Phillip Kent

The Fairchild 24W Argus is an excellent choice for a scale subject, and it certainly is different from the typical Piper Cub and Taylorcraft. Though out of the ordinary, it retains smooth and undemanding flight characteristics. This version of the Argus was derived from my first version—a 36-inch rubber-powered model I built in 1949. The new RC model is built slightly larger than ⅕ scale, and this gives an impressive yet manageable wingspan of 90 inches. I powered the prototype model with a Laser 100 4-stroke engine that just fits within the radial cowl. You can also build the Ranger-powered in-line engine version of the Argus, as I have included details for it on the plan. But be careful; the model could come out nose-heavy! I did not need to add any nose weight to the radial-engine version, so if you fit a lighter engine and rearrange the radio gear, you may be able to build the in-line version without difficulty; I have not built it this way, so you're on your own.

SPECIFICATIONS

NAME: Fairchild 24

TYPE: scale monoplane

SCALE: 1:4.8

WINGSPAN: 90 in.

LENGTH: 59 in.

WING AREA: 1,235 sq. in.

WEIGHT: 10 to 12 lb.

WING LOADING: 18.82 oz./sq. ft. at 10 lb.

ENGINE REQ'D: .90 to 1.20 4-stroke

ENGINE USED: Laser 100 4-stroke

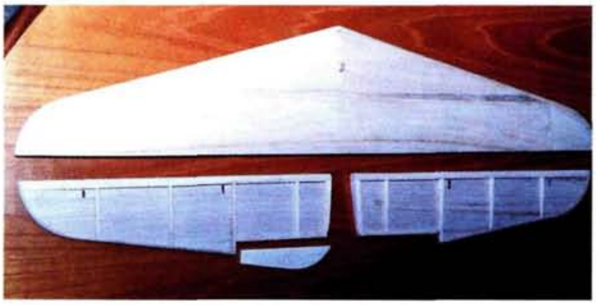
RADIO REQ'D: 5-channel (rudder, aileron, throttle, elevator and flap)

COMMENTS: designed by Phillip Ke[nt,] the Fairchild 24 is a seldom modele[d] monoplane from the mid-1930s. It [can] be built with either a radial or in-lin[e] engine cowl (both are shown on the plan). The landing gear is articulate[d] and is detailed on the plan. The mo[del] uses traditional balsa and plywood construction and is fabric covered.

TAIL UNIT

The rudder and elevators have a 1/16-inch core sheet. You build them using half ribs glued on the top and bottom. Cut the elevator's core sheets to shape, then cut the 5/16-inch sheet spars and glue them to the top of the core sheets. Add the 1/16-inch half ribs, the tips and the inboard sheet parts, and sand the unit to shape. Remove it from the work board and repeat the process on the second side. This technique produces a light, stiff structure that looks very scale when covered. Build the rudder in the same way, but use a 1/16-inch core sheet and 1/8-inch half ribs.

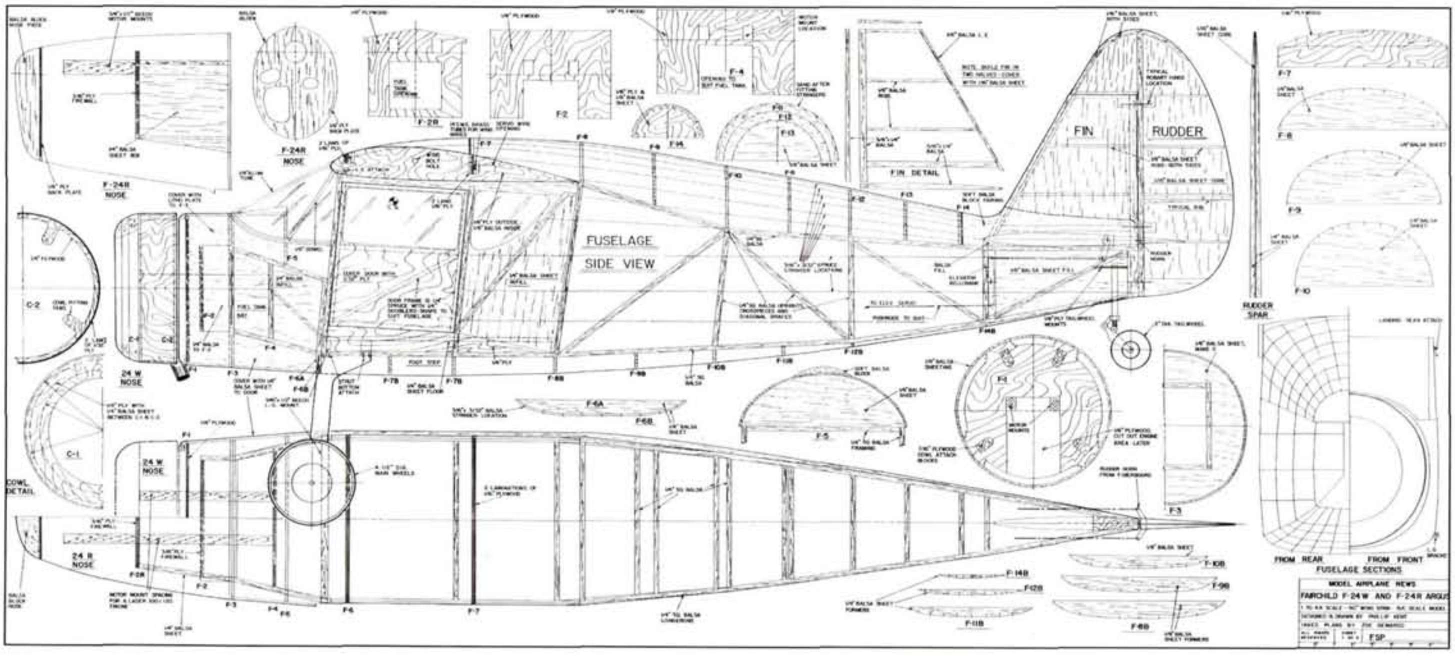
The horizontal stabilizer is built in two halves over the plan. Cut the 1/4-inch-thick balsa trailing-edge spars to size and pin them into place using the plan as a guide. Glue the ribs, tip parts and plywood braces into place, then add the 1/8-inch sheet subleading edge. Sand the structure to the cross-section shown on the plan, and then cover it with 1/16-inch balsa sheeting. To complete the structure, remove it from the building board and add the ribs to the underside, then add the 1/4-inch balsa leading edge. After the glue has dried, sand it to final shape. Build the vertical fin using the same technique. I find that balsa cement or aliphatic is the best glue to use with this building technique. It can be sanded easily and doesn't leave a ridge between parts. CA glue dries too hard and is difficult to sand smooth.

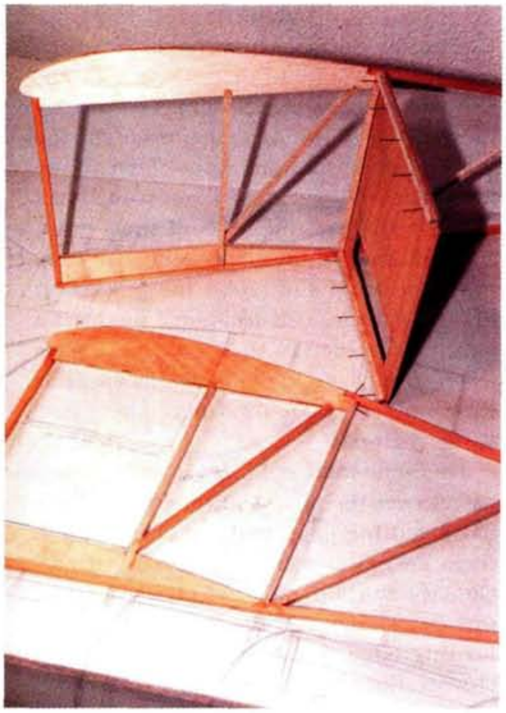


Top: the Argus in military colors. Left: the tail surfaces are built using a core sheet and are assembled flat on the building board using half ribs. Here, the finished fin and rudder are ready to cover. Above: the horizontal stabilizer and elevators are built in the same way as the fin and rudder. Notice the scale trim tabs on the elevator; they are added after the elevator halves have been covered.

All the hinges on the model are Robart HingePoints. For a scale appearance, they are inset into notches in the trailing edge of the vertical fin and the leading edges of the elevator halves. Be sure to add balsa blocks to the hinge locations to provide adequate gluing surfaces. To connect the elevator halves, I used a 3/32-inch music-wire joiner to the center of which I silver-soldered a brass control horn. You may be able to find a commercially available joiner with the control horn attached, but note the forward angle required on the horn to clear the fuselage structure.

To order the full-size plan, turn to "RC Store.com" on page 136.





Left: the wing uses traditional construction methods and has main and rear spars. The trailing edge is plywood, and the large sheeted area is a removable dummy fuel-tank cover that provides access to the flap and aileron servos.
Right: the fuselage starts as two side frames made of balsa and spruce sticks. Once these have been assembled, add the formers to give the fuselage its shape.
Below: when you install the stringers, cut the notches in the formers as you go. This way, you can position them correctly and make sure that they are straight.

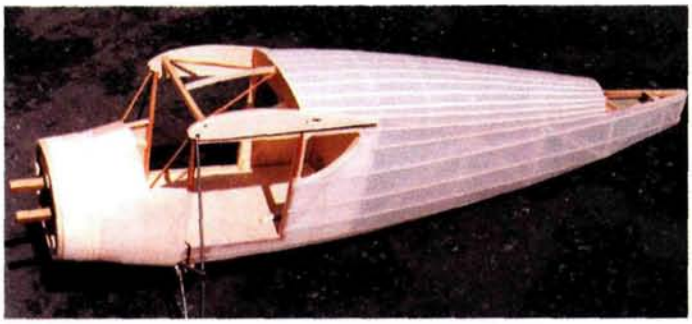
WINGS

To cut out the wing ribs, I made a full-rib template from plywood using the cross-section of the wing at R-3 as the master. I duplicated all the spar openings and notches, then I cut the 24 full ribs needed to complete the two wing panels from ⅛-inch-thick balsa. These ribs can then be cut into shape to create the R-3 ribs (flap section) and the R-4 ribs (aileron section). The flap ribs that support the offset hinges require 1/16-inch plywood doublers. Bond the doublers to both sides of the ribs with epoxy. Note that the rib between the flap and the aileron also requires a plywood doubler to add rigidity. The root end of the wing panels is tapered sharply inward to align with the cabin and windshield structures. Finish the rib-cutting job by cutting out the smaller R-1, R-2 and root ribs, as well as the outer R-5 and R-6 tip ribs.

Pin the bottom main spar into place over the plan, and glue the ribs to the spar. Glue the sub-leading edge into place and then add the plywood trailing edge, the aileron and flap spars, the rear spar and the top main spar. Note that the aileron-attachment spar is made of two pieces of sheet balsa. I find it easier to carve the two-piece spar to shape before fitting it into place at the back of the ribs. Rib section R-4 on the plan shows the proper cross-section shape.

I made the laminated wingtip bows by wrapping four 1/16x1/4-inch balsa strips around a 1/4-inch-thick plywood former. Cut the strips a little longer than needed to give yourself some room to work; then use a water-based glue to laminate them together. Tape the strips to the former at their midpoints and then work outward, bending them against the former; use more tape to hold them securely until the glue dries. Leave them overnight and then remove them from the former and cut them to the final shape. Remove the wing panel from the board, glue the tip bow into place, and fill in the areas between the ribs, spars and leading edge with 3/32-inch balsa sheet, where needed.

This is a good time to install the 3/32-inch wing-joining wires at the root ends of the wing panels. Fill the area between the top and bottom main spars with ¼-inch balsa, then bend the wires to shape and position them as shown in the wing top view. Set up the wing panel so there is 1⅞ inches dihedral under the last full rib, and position the wires so they are level with the building board. Secure the wires with grooved basswood blocks, and glue them into place against the front and rear spars.



Left: covered with iron-on fabric, the model's attractive lines are apparent. Right: the cabin door is built using a basswood frame covered with thin sheet plywood.

Pin the wing panel back onto the board and fit the 1/16-inch balsa vertical-grain shear webbing to the aft edge of the main spar. Remove the wing from the board, install the plywood reinforcement plates on the spars and attach the lift-strut attachment brackets. You can now add the 1/16-inch top and bottom leading-edge sheeting and the rib capstrips. The ailerons are built over the plan but separately from the main wing panel; they are fitted into place later. To operate smoothly, the aileron's hinges must be extended with lengths of aluminum tubes to correctly position their pivot pins. Do not omit the small ply gussets at the rib trailing edges.

The flaps are made of 1/16-inch plywood and use either basswood or plywood ribs. To prevent the flaps from warping, cover both the inside and outside surfaces with a light coat of finishing resin. Use Robart HingePoints to attach the flaps to the wing. The wing cross-section drawing shows the hinging detail. On my prototype model, I installed both the flap and aileron servos under a removable fuel-tank cover made from 1/8-inch balsa sheeting. You can also install the servos in front of each control surface and run long servo leads to the root rib. It is a personal choice.

FUSELAGE

The fuselage is built around a simple box structure that is filled out with formers and stringers. Start by building the two stick side frames directly over the plan. I used spruce and basswood for the longerons and balsa for the uprights and cross-members.

THE FAIRCHILD 24

Warner 165hp Super-Scarab-powered Fairchild 24W-41A

The full-size Fairchild 24 was a fabric-covered, 3-seater monoplane built by the Fairchild Aircraft Corp. of Hagerstown, MD, in 1935. Powered by a 145hp Warner Super-Scarab radial engine, it was originally produced as the Fairchild 24C8-C with a smaller engine cowl with blister fairings and a more rounded fin and rudder. An improved version, the 24 C8-F, was introduced in 1936; it was powered by an inverted Ranger 6-390-D3 in-line 133hp engine. Four-seat versions—the 24W-41A (Argus 2) and the 24R (Argus 3), both powered by the 165hp Warner Super-Scarab radial engine—were introduced shortly thereafter. From 1939 to '45, the Argus 2 was built in large numbers for the USAAF. It was also supplied to the British Air Ministry under the Lend-Lease agreement with Great Britain. After the War, several of these aircraft were bought for civilian use, both in Britain and in the United States.

SPECIFICATIONS

WINGSPAN: 36 ft., 4 in.

LENGTH: 23 ft., 9 in. (radial); 25 ft., 10 in. (in-line)

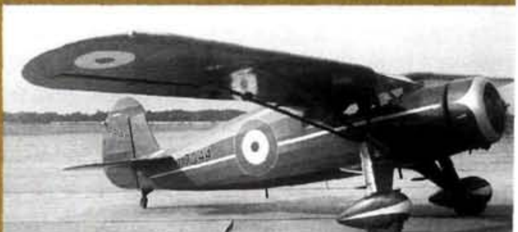
HEIGHT: 8 ft.

MAX. AIRSPEED: 135mph

CRUISE SPEED: 112mph

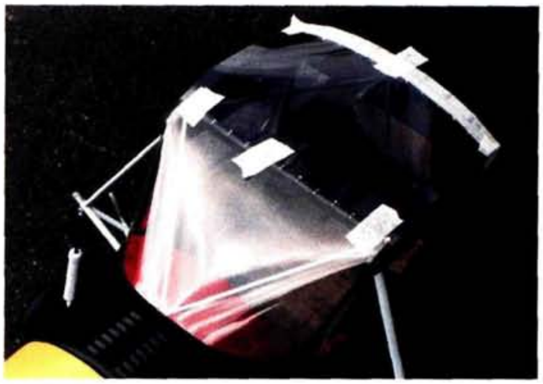
LANDING SPEED: 48mph (with flaps)

Three-passenger Fairchild 24 C8-C.



Four-passenger 24W-41A Argus 2 in British markings.

The 24C8-F with in-line Ranger engine.



Top left: the finished cabin door is functional. Note the small door handle and the attractive window coaming. Above right: use stiff paper templates to establish the shape of the windows and windshield; then cut the clear plastic to shape and screw everything into place with small screws. Take your time, and do the job right. Left: the lower windshield fairing is made of a thick mixture of epoxy and microballoons. Once the fairing has been painted, the finished effect is very impressive.

To make construction a bit easier, I assembled the fuselage section forward of the wing complete with engine-bearing rails, and then I joined the two completed sections to form the finished structure.

Once the basic rear box is built, make and install the landing-gear-attachment parts, and then attach the wing attachment tubes to the top of the cabin structure. Once these parts are installed, you can complete the fuselage by adding the remaining formers and stringers. The formers show the positions of the stringers, but don't cut out the notches until after you've positioned the stringers. This way, you can sight along their lengths and make sure that they are straight and properly placed before you cut the individual notches. Take your time, and you'll be rewarded with a great-looking finish.

I built the functional cabin doors using a basswood frame that I covered with 0.4mm plywood. I used Robart HingePoints to hinge the door. Now is a good time to install all the pushrods and bellcranks for the elevator and rudder controls. You must also fabricate and install the shock-absorbing tailwheel unit before you cover the model.

Fit the fuel-tank support box into place before you cover the nose section with the 1/8-inch sheet-balsa planking. The tank is accessible from the front of the model, but first, you have to remove the engine.

ENGINE COWL

The radial-engine cowl is completely circular and is easy to make. Cut the two cowl formers to shape, and tack-glue them together with a spacer block between them. Wrap two layers of 1/32-inch plywood around the formers and laminate the plywood together. Glue the sheet balsa front section to the plywood and then carve the balsa to shape. After you've sanded it smooth, seal the cowl with finishing resin, then sand it smooth again. You can also make the cowl with fiberglass by carving a large block of foam to shape and covering it with glass cloth and epoxy; dig the foam out and sand the outside surface smooth. It's up to you.

FINAL ASSEMBLY AND DETAILS

The functional scale landing gear shown on the plan is drawn to represent the actual gear found on an Australian full-size aircraft, and no fairings are used around the Oleo struts. You can make fairings by carving balsa to shape and covering it with thin lithoplate aluminum. The windshield glazing and windows are added to the model after it has been covered and painted. I used stiff paper templates to establish the windshield's proper shape, and after cutting the clear plastic sheets to shape, I used small screws to fasten them into place over a wood frame. To fair the bottom edges of the windshield into the fuselage, I used a thick mixture of epoxy and microballoons that I smoothed to shape with a finger dipped in acetone. You can add all the little details that bring any model to life if you feel so inclined. Rib stitching and tapes, navigation lights, cockpit interior details and a dummy radial engine to fill that big round cowl are all things I encourage you to add.

FLIGHT PERFORMANCE

Before you head to the flying field, make sure that all the nuts and bolts are tight and have been properly attached to the model. Also double-check the model's CG. Except for an exciting first flight when I forgot to attach a single screw to the landing-gear/lift-strut attachment point, all flights have been delightful.

The Laser 100 4-stroke engine provides plenty of power to fly the Fairchild around nicely. Rudder correction is needed on takeoff, but if you advance the throttle slowly and steadily, required heading corrections are minimal.

The model is not intended for aerobatic maneuvers, but just doing the odd touch-and-go slow flying suits me just fine. For scale-like flight, 1/2 throttle is more than enough.

The flaps add interest to the flight program, and you will probably find that a little bit of down-trim will need to be mixed in to prevent the model from ballooning when the flaps are lowered for landing. You can also mix a little rudder into the aileron channel, as you need to coordinate the two for nice turns. I haven't tried it yet, but I hear that a gyro used on the rudder comes in handy while landing and taking off from paved runways. Can't wait to try.

I covered the model with an iron-on fabric covering material to which I added a shrink coat of dope. I then used dope to glue on the surface details. I added a coat of cellulose primer and painted it with sprayed-on cellulose automotive paint. I used trim sheets for the numbers and lettering, and I painted on the national insignias. To seal everything nicely, I sprayed on a two-part, clear fuelproofer.

All that's left to do is to add your radio gear and to make sure the model balances at the point shown on the plan. Move your radio gear and battery around, and add nose weight if you have to, but don't try to fly the model with the balance point aft of the position shown. You can adjust the balance point after the first few flights to suit your flying style.

I thoroughly enjoyed building and flying the Fairchild 24, as it is a seldom-modeled scale project. I hope you decide to build one of your own; I know you will enjoy the way it flies. Have fun! ✈

Laser*; distributed by Proctor Enterprises (503) 678-1300; proctor-enterprises.com.*

Robart Mfg*. (630) 584-7616; robart.com.*

Top: I made my radial-engine cowl with thin plywood wrapped around the cowl former. The front section is balsa sheet carved and sanded to shape. Right: a very distinctive part of the Fairchild 24 is its landing gear. The functional shock-absorbing gear is shown in detail on the plan. Bottom: the tailwheel is also functional and must be built and installed before you cover the fuselage.

by Dave Gierke

Balancing 2-, 3- and 4-blade props

A propeller converts the engine's torque into thrust. "Prop" is slang derived from the root word propeller, which means, "It breaks on landing." Seriously, though, it wasn't too long ago that propellers were primarily made of wood—a good choice, except that wood is vulnerable to breakage. Today, the hobby industry sells about 20 composite plastic props for every wooden one sold. This doesn't necessarily mean that wooden propellers are inferior; many fliers still consider wood to be superior in terms of strength and aesthetics.

Wood's high strength-to-weight ratio and ability to continually flex without fatigue are its main recommendations. Unfortunately, wood isn't the most stable material. Although manufacturers try to compensate for its inconsistencies (bending, twisting and warping), a wooden prop from a hobby shop still needs to be balanced before it's ready to fly. Composite plastic propellers are more stable in terms of maintaining their shape, but they can have problems caused by unsuspecting or careless modelers who drill them to fit the engine's shaft; an unbalanced propeller is often the result of faulty technique.

Balancing is the process of removing weight (material) in a systematic manner from specific surfaces of the propeller to bring it to a state of equilibrium while suspended from an accurate balancing instrument. Because propellers spin at high rpm, it's important to precisely balance them to avoid transferring damaging vibrations to the engine and airframe. Most propellers need to be balanced. Occasionally, you'll find one that doesn't require alteration, but you'll need a balancing instrument to determine this. Balancing techniques vary depending on whether the propeller is a 2-blade, 3-blade, or 4-blade unit. Here's how to balance each.

BALANCERS

Several types of balancers are on the market today, but I'm partial to the Robart High Point unit, which has been used in the industry for decades. The propeller balancing shaft is supported at each end by two large aluminum discs that pivot individually on Jewel-type axles. Capitalizing on the balancer's large mechanical advantage, no appreciable friction is transferred to the task at hand. The High Point unit doesn't need to be leveled to function flawlessly, either.

BALANCING A 2-BLADE PROP

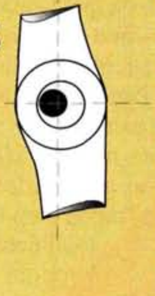
Because balancing the common 2-blade propeller appears to be a straightforward matter, modelers sometimes take the process for granted; this often results in a botched job. The process is simple, but it must be performed correctly.

ENLARGING THE PROP-SHAFT HOLE

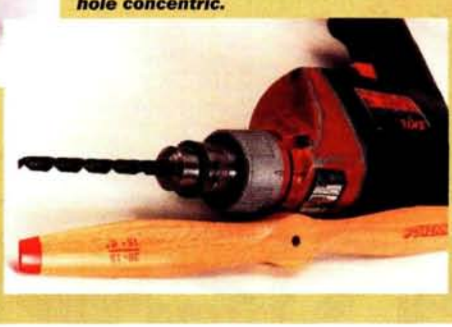
I don't have statistics, but it's my belief that more propellers are ruined when they're drilled out to fit the engine's shaft than are broken during landings. Sadly, many of these dangerously out-of-balance props get fastened to the engine's shaft anyway!

What could be simpler: find a twist drill; mount it in a drill motor, and drill the hole—right? Probably not! Here's just a partial list of things that can go wrong.

- Wrong drill-bit size. If the hole is too big, the propeller will rattle around on the crankshaft and will be impossible to balance.
- A hand-held drill motor stands little chance of producing a straight hole through the hub.



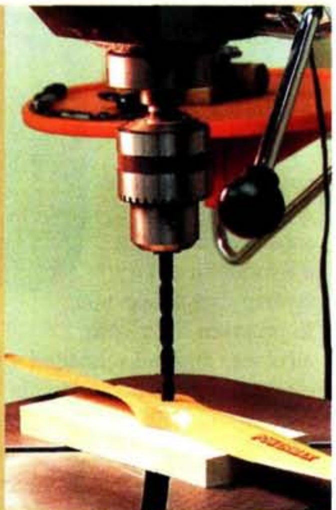
A hand reamer in the process of enlarging the hole through a composite propeller. This is the best method for keeping the hole concentric.



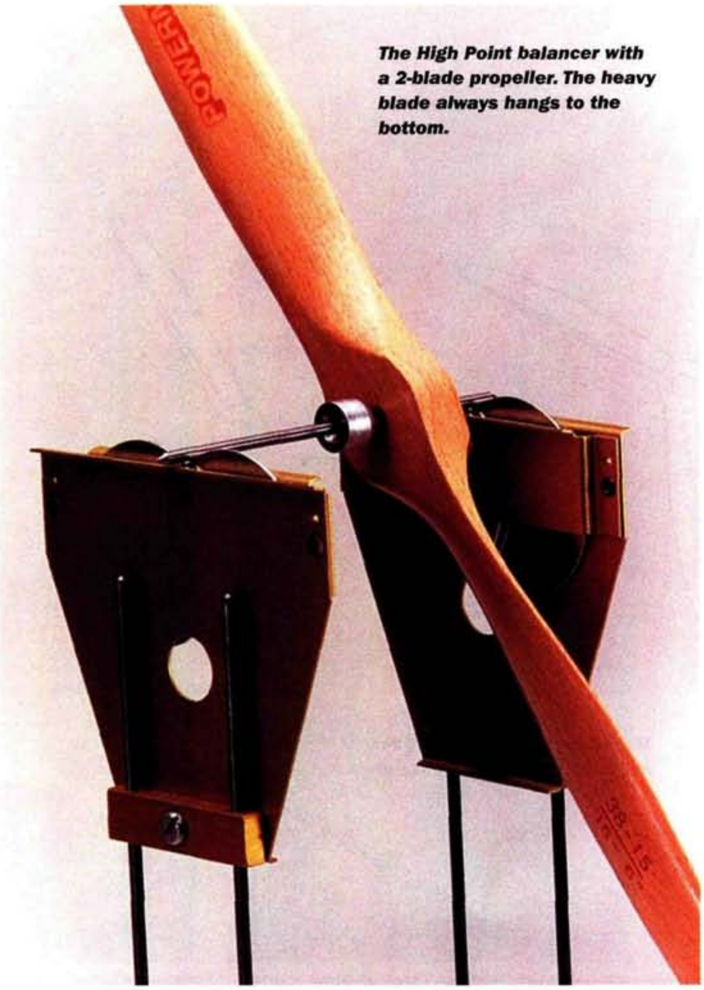
A hand-held drill motor, twist drill and propeller. These units should be mutually exclusive; never enlarge a propeller hole with a hand drill!

- When you use a drill press, there's a chance that the propeller (which you're holding with one hand) will be yanked from your grip, producing a whirling weapon.
- If you're successful at producing a straight hole through the prop hub, chances are it isn't concentric with the manufacturer's pilot hole; twist drills have an aggravating tendency to bore off-center (see figure), sometimes making the propeller impossible to balance. The problem disappears if the prop is clamped to the drill press table, but this is often difficult because of the limited hub-clamping area—especially with smaller propellers.

What's the answer? Manual prop reamers! These are multi-fluted cutting tools designed to enlarge cylindrical holes while maintaining concentricity. In simple terms, the reamer is designed to avoid the problems generated by the twist drill! Fox Mfg., Horizon and Great Planes all make T-handle prop reamers for .15- to .60-size engines; Dave Gierke Flying Models makes one for larger engines. These are intended only for manual operation. As with the machine-driven twist drill, safety is a concern; don't use a step reamer in a drill press or hand-held drill motor.



The drill press is set up to enlarge the hole through the propeller hub. Although a technically superior method compared with using the hand-held drill motor, the prop can easily get out of control while being held by only one hand—a very unsafe practice!



The High Point balancer with a 2-blade propeller. The heavy blade always hangs to the bottom.

WHAT YOU'LL NEED

Wooden propeller
- Balancer
- Abrasive paper (100-grit, 220-grit garnet, 400-grit silicon carbide)
- Gap-filling CA and accelerator
- Plastic sandwich wrap

Composite propeller
- Balancer
- Half-round woodworking file (coarse)
- Hobby knife with no. 11 blade
- Abrasive paper (100-grit, 220-grit garnet)

Materials needed to balance wooden and composite plastic propellers.

1 Enlarge the shaft hole size to fit your engine (see the sidebar, "Enlarging the prop-shaft hole"). If the hole is already too large, use another prop.

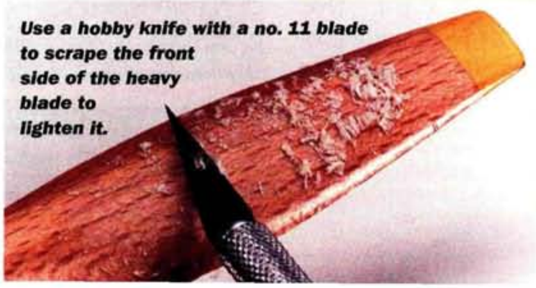
2 Place the propeller horizontally on the balancer to find the heavy blade (see Figure 1).

3 Next, place the prop on the balancer exactly in the vertical position, with the heavy blade at the bottom. If it rotates to a new equilibrium point, it has a heavy edge (see Figure 2).

Two methods are commonly used to balance the propeller. The first involves lightening the heavy blade until the propeller balances in the horizontal position and then removing material from the heavy edge (at the hub) to balance the unit vertically. Unfortunately, removing material from the hub weakens it, so to be safe, don't remove material from the propeller hub.

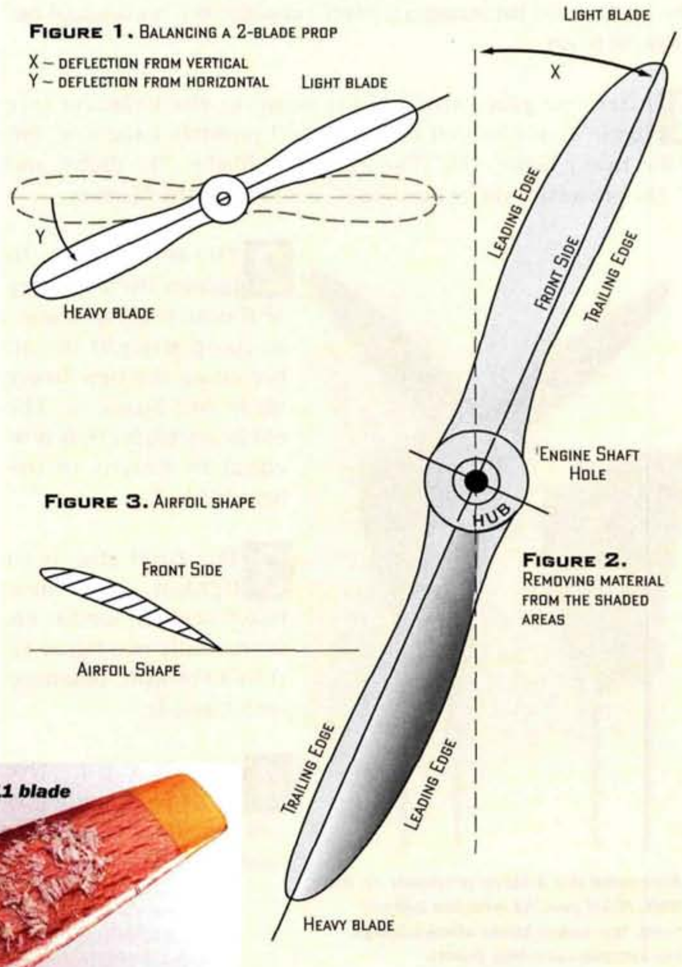
4 The preferred method is to lighten the heavy blade and the heavy edge at the same time without altering the hub. To accomplish this, remove material from the shaded area of the propeller as in Figure 2.

When you remove material from the heavy blade, sand, scrape, or file it from the front side, not the back side (this would adversely alter the prop's pitch). When you remove material from the front side of the blade, be sure to maintain its airfoil shape (see Figure 3). Last, don't remove stock from the blade tip and trailing edge; these are already thin and shouldn't be reduced any further.



Use a hobby knife with a no. 11 blade to scrape the front side of the heavy blade to lighten it.

TWO-BLADE PROPELLER BALANCING



THREE-BLADE PROPELLER BALANCING

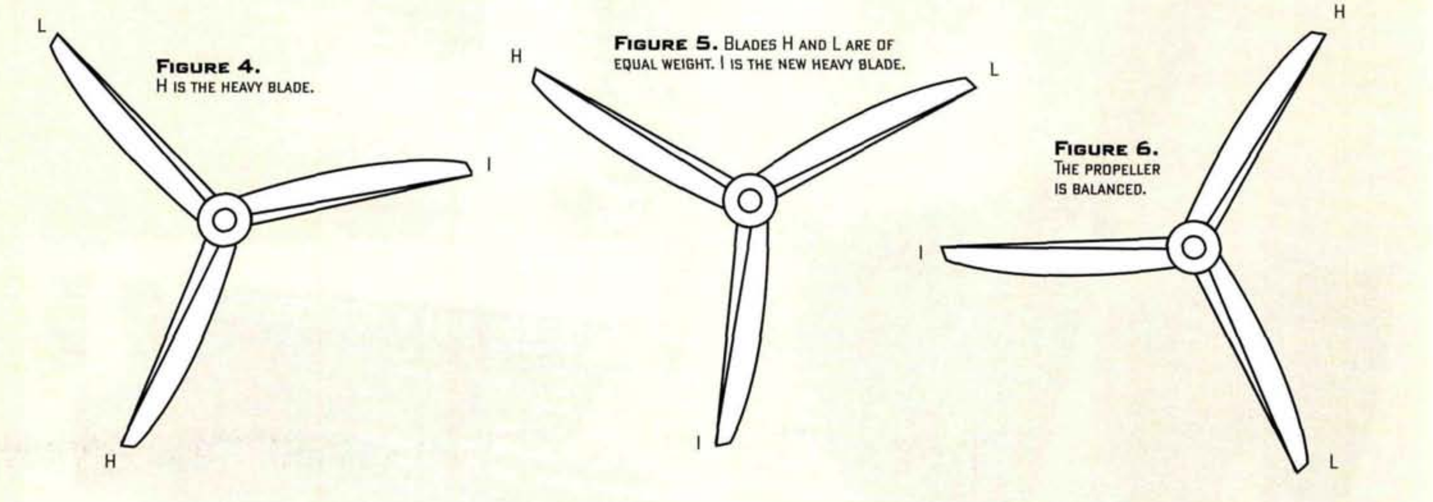


Figure 4. H is the heavy blade.

Figure 5. Blades H and L are of equal weight. I is the new heavy blade.

Figure 6. The propeller is balanced.

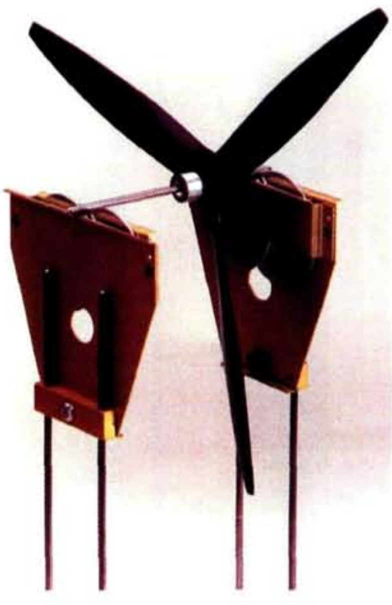
5 When the propeller balances horizontally and hangs vertically with either blade in the down position, the balancing job is almost complete.

6 Wooden and composite plastic props should be final-sanded using a fine abrasive paper such as 220-grit or finer garnet. For wooden props, see the sidebar, "Finishing a wooden prop."

BALANCING A 3-BLADE PROPELLER

The method for balancing a 3-blade propeller is a bit unusual but is simple to do.

1 After you place the 3-blade prop on the balancer (see Figure 4), notice that one blade will probably hang low; this is the heavy blade, "H." The other two blades, "L" (light) and "I" (in between), will be positioned as shown in the diagram.



Balancing the 3-blade propeller on the High Point unit. As with the 2-blade prop, the heavy blade always hangs lowest (your starting point).

2 The next step is to lighten the front face of H until it allows blade I to hang straight down, becoming the new heavy blade (see Figure 5). The old heavy blade, H, is now equal in weight to the light blade, L.

3 The final step is to lighten the new heavy blade (I) until it sits horizontally (see Figure 6), thus becoming balanced with L and H.

4 Finish-sand the 3-blade propeller as you did the 2-blade unit, and it's ready to run.

100-grit garnet abrasive paper works well for wooden propellers.

SMOOTH A VIBRATING ENGINE WITH AN UNBALANCED PROP

Many antique model engines were notable for their tendency to vibrate. Heavy iron or steel pistons were usually the culprits, along with inadequate crankshaft counterbalancing. Here's a simple trick to smooth things out.

- **Make sure that the piston is at top dead center.**
- **Place an unbalanced propeller on the offending engine's propeller shaft with the heavy end pointing straight down.**
- **Install the prop washer and tighten the prop nut.**

The heavy blade adds to the counterbalance weight and results in smoother engine operation. This will only work with engines that have inadequate crankshaft counterbalance weight. The only other drawback concerns the poor position of the propeller for hand starting; however, this isn't a problem if you use an electric starter. This works especially well with many ignition engines, as well as with some early glow Fox, K&B Torpedo and McCoy engines.

Antique engines with heavy pistons can benefit from an unbalanced propeller.

FINISHING A WOODEN PROP

Because the exposed wood grain is susceptible to absorbing water and oil, it must be recoated with a sealant. Try this quick and effective method.

1. Apply a liberal drop of CA to the balanced blade of the wooden propeller to seal it against water and oil.

2. With plastic sandwich wrap protecting your finger, spread the CA over the raw wood portion of the balanced propeller blade.

3. To speed the sealing process, spray a bit of CA accelerator to the still liquid CA.

4. Lightly sand the hardened CA with 400-grit wet or dry silicon-carbide abrasive paper. Recheck the balance. If necessary, add a bit of CA to the opposite blade.

FOUR-BLADE PROPELLER BALANCING

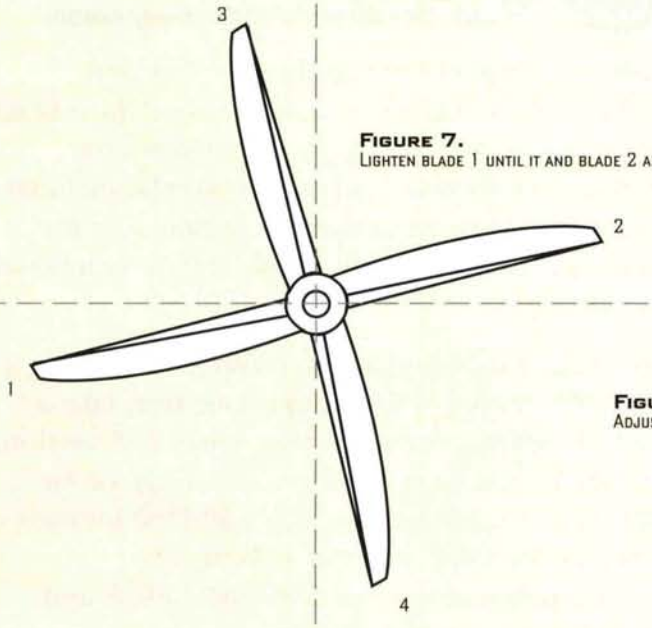


Figure 7. Lighten blade 1 until it and blade 2 are horizontal.

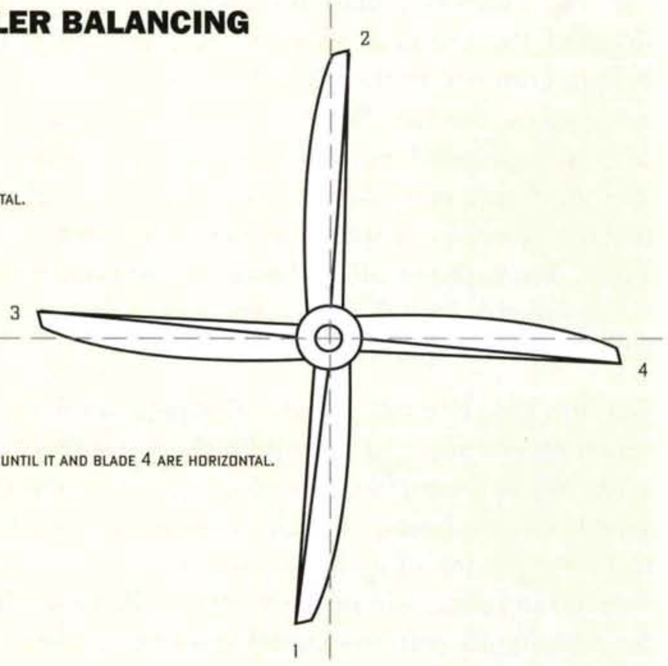


Figure 8. Adjust blade 3 until it and blade 4 are horizontal.

BALANCING A 4-BLADE PROP

A 4-blade propeller is the easiest type to balance. Balance it as you would two, 2-blade props that are fastened (at the hub) 90 degrees to each other.

1 Lighten blade 1 until blades 1 and 2 are horizontal (see Figure 7).

2 Rotate blades 3 and 4 to the horizontal position. If they move to a new equilibrium point (see Figure 8), remove material from the front of blade 3 until blades 3 and 4 are balanced horizontally. Recheck blades 1 and 2, making minor adjustments until the propeller remains in any position around its rotation.

3 Finish-sand.

FINAL THOUGHTS

The time and effort it takes to balance your propellers is well worth the result; you'll be rewarded with a longer-lasting airframe and an engine that runs more smoothly. You spend so much time building your airplane and tuning your engine that they deserve a balanced propeller.

Dave Gierke Flying Models. *(716) 681-4840.*

Fox Mfg. *(479) 646-1656; foxmanufacturing.com.*

Great Planes Model Mfg. Co. *(800) 637-7660; greatplanes.com.*

Horizon Hobby Inc. *(800) 338-4639; horizonhobby.com.*

K&B Model Products Inc. *(626) 359-9527; modelengine.com.*

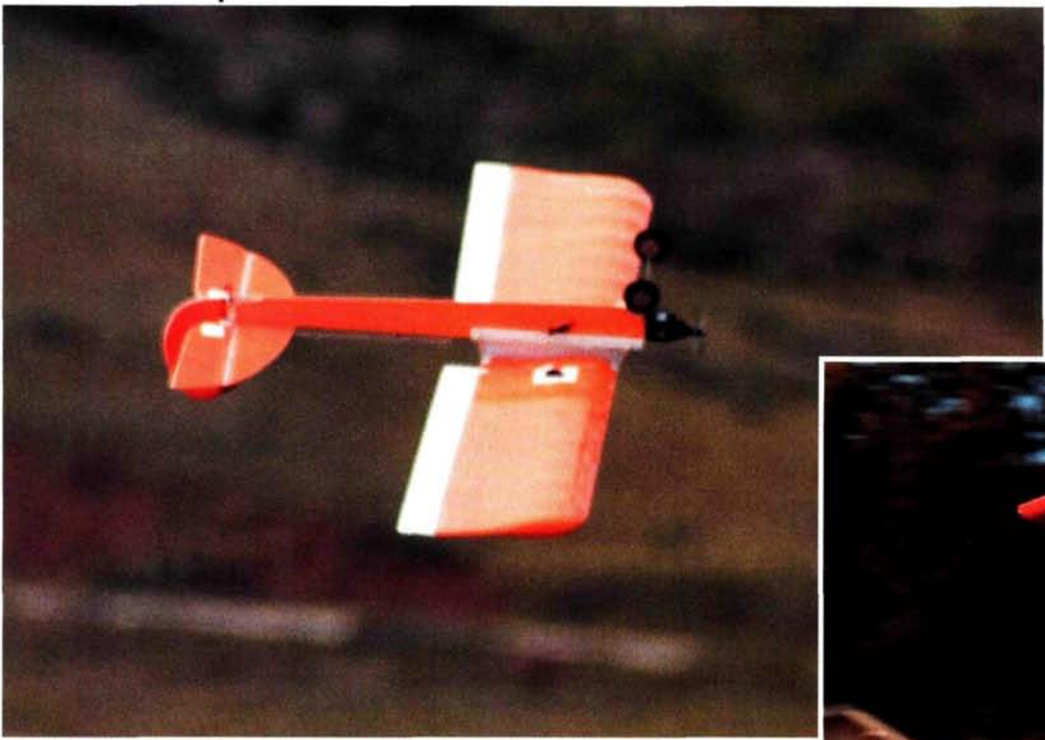
McCoy Racing. *(626) 359-0016.*

Robart Mfg. *(630) 584-7616; robart.com.*

by Jef Raskin

PHOTOS BY AZA, AVIVA & JEF RASKIN

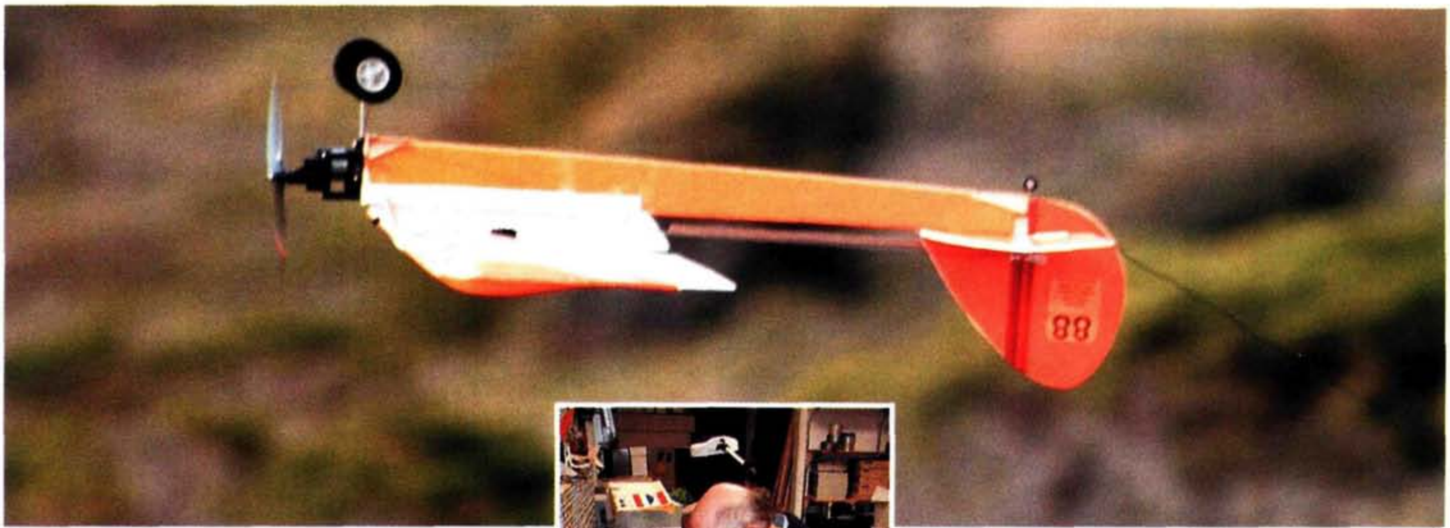
Crazy aerobatics!



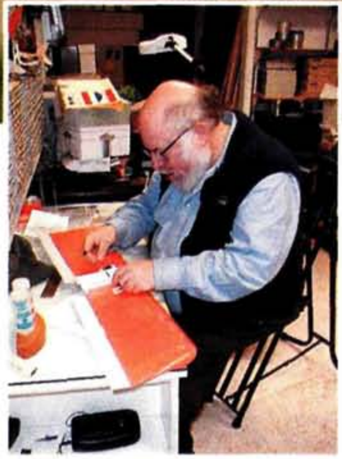
RC aerobatics: it's ballet in the air, painting lines in three dimensions, a sport, a hobby and an art form. It's also the most exhilarating kind of flying I know. For me, the combination of being the pilot *and* being able to watch the results is an unbeatable high. Now, high-performance aerobatic aircraft that you can fly in a small park have become available, even in almost-ready-to-fly (ARF) versions. Park flyers, with their silent operation and ability to fly in small fields in populated areas, are opening up our hobby to more people every day. Most of these airplanes are pretty tame, with their undercambered or flat-bottom wings and rudder/elevator/motor controls, but quite a few adrenaline-pumping aircraft have recently hit the scene. I've been doing a lot of flying with a WattAge Crazy Max. What can it do? I could fill this whole article with the names of maneuvers: axial rolls, inverted circles, point rolls, loops inside and outside starting from the top or starting from the bottom, avalanches, snap rolls, hammerheads, Immelmans, Cuban-8s, split-Ss, humpty-bumps, spins, inverted spins ...

And flight times aren't limited to a minute or two. Depending on your battery selection and flying style, you'll get at least 5 minutes of action—you could even go a solid 10 minutes! The Crazy Max is an outstanding aerobatic value at about $50. It comes complete with motor, gearbox, prop, and all the goodies except the RC system; you even get a great manual as a bonus. WattAge deserves kudos for a fine job.

Perhaps to make the plane fly more like a trainer, it comes with some incidence in the wing, i.e., the leading edge is higher than the trailing edge. It flies fine this way, and it can do a lot of aerobatics. But to get to the next level of precision, I glued tapered balsa pieces to the bottom of the wing saddle, where it rests on the fuselage, so that the wing is parallel to the top of the fuselage. This also makes the wing parallel to the stabilizer. Called a zero-zero setup, this is standard for precision aerobatics. By setting the model at zero-zero, and by stiffening the pushrods by gluing ¼-inch-square balsa sticks along their lengths, you can make the Max do any maneuver. The only exceptions are maneuvers that require gobs of power, such as unlimited vertical climbs, hovering maneuvers and knife-edge flight. My slightly modified Crazy Max is fun to fly. It's sturdy and inexpensive, so I'm not afraid to fly it aggressively. A few times I was sure that I had bent the wing on a tight pull-up from an all-out dive; however, it never showed the least crinkle. That wing is strong! Unfortunately, the wheels are not strong, and I switched to 1.5-inch Hobby Lobby LYT wheels. I also saved myself some time and made adjustments easier by using Du-Bro miniature pushrod connectors. They



are a snap fit into the Hitec HS-50 servos that I used on Max.



IN THE AIR

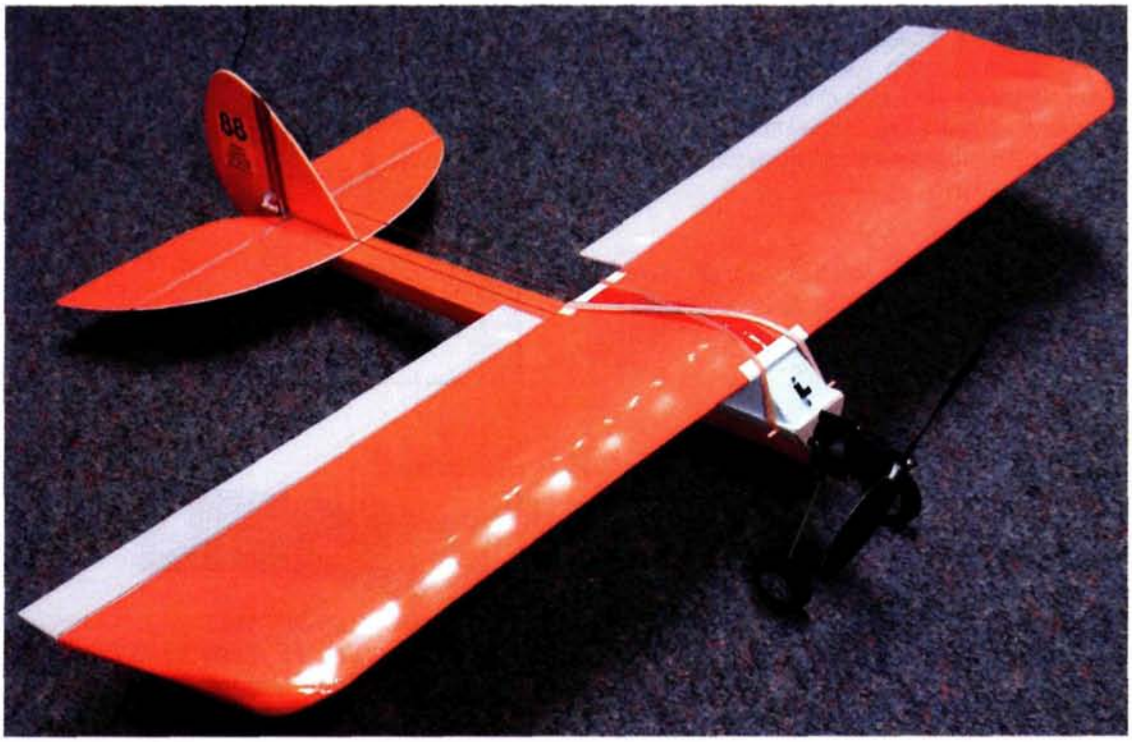
Takeoff is straightforward on a smooth surface, requiring little or no rudder to get into the air. Rudder control is positive. The Max is small, and takeoff from grass is not practical. A hand-launch does not require an athletic arm. Landings are also easy; the model's power-off glide slope is steep enough to make it easy to land wherever you wish, yet there is enough glide energy to make a pretty flare and light-as-a-feather touchdowns. If you do need to go around, a sudden application of power won't cause a snap into the ground. Because of the forward location of the landing gear, it sometimes does a mild ground loop on landing.

The low aspect ratio and nearly rectangular planform of the Max make slow-speed flight easy and safe. Stalls are very mild and can be quickly recovered from. When you pour on the coals and put the nose down, the Max will zip from one side of a soccer field to the other in a few seconds. Because it can move quickly, it can be flown in winds that would defeat slower park flyers.

With full-house control and a symmetrical airfoil, there is little that the Max can't do in the air. I fitted mine with four servos (an option covered in the manual) and used a computer radio to droop both ailerons when the elevator goes up, and vice versa. This makes loops tighter.

Aerobatics is what this model is all about, and it delivers! ✈

Du-Bro Products *(800) 848-9411; dubro.com.*
Global Hobby Distributors *(714) 963-0133; globalhobby.com.*
Hitec RCD Inc. *(858) 748-8440; hitecrcd.com.*
Hobby Lobby Intl. *(615) 373-1444; hobby-lobby.com.*
WattAge *distributed by Global Hobby Distributors.*



SPECIFICATIONS

MODEL: Crazy Max

MANUFACTURER: WattAge

DISTRIBUTOR: Global Hobby

TYPE: aerobatic park flyer

WINGSPAN: 35 in.

WING AREA: 284 sq. in.

LENGTH: 26 in.

WEIGHT: 15 oz.

WING LOADING: 7.6 oz./sq. ft.

NO. OF CHANNELS: 4 (elevator, rudder, ailerons, motor)

DRIVE SYSTEM: Speed 370 brushed motor geared 3.67:1 and a 7.5x5 prop (supplied)

BATTERY USED: 680mAh NiMH

PRICE: $50

IMAC Aerobatics

Figure-N

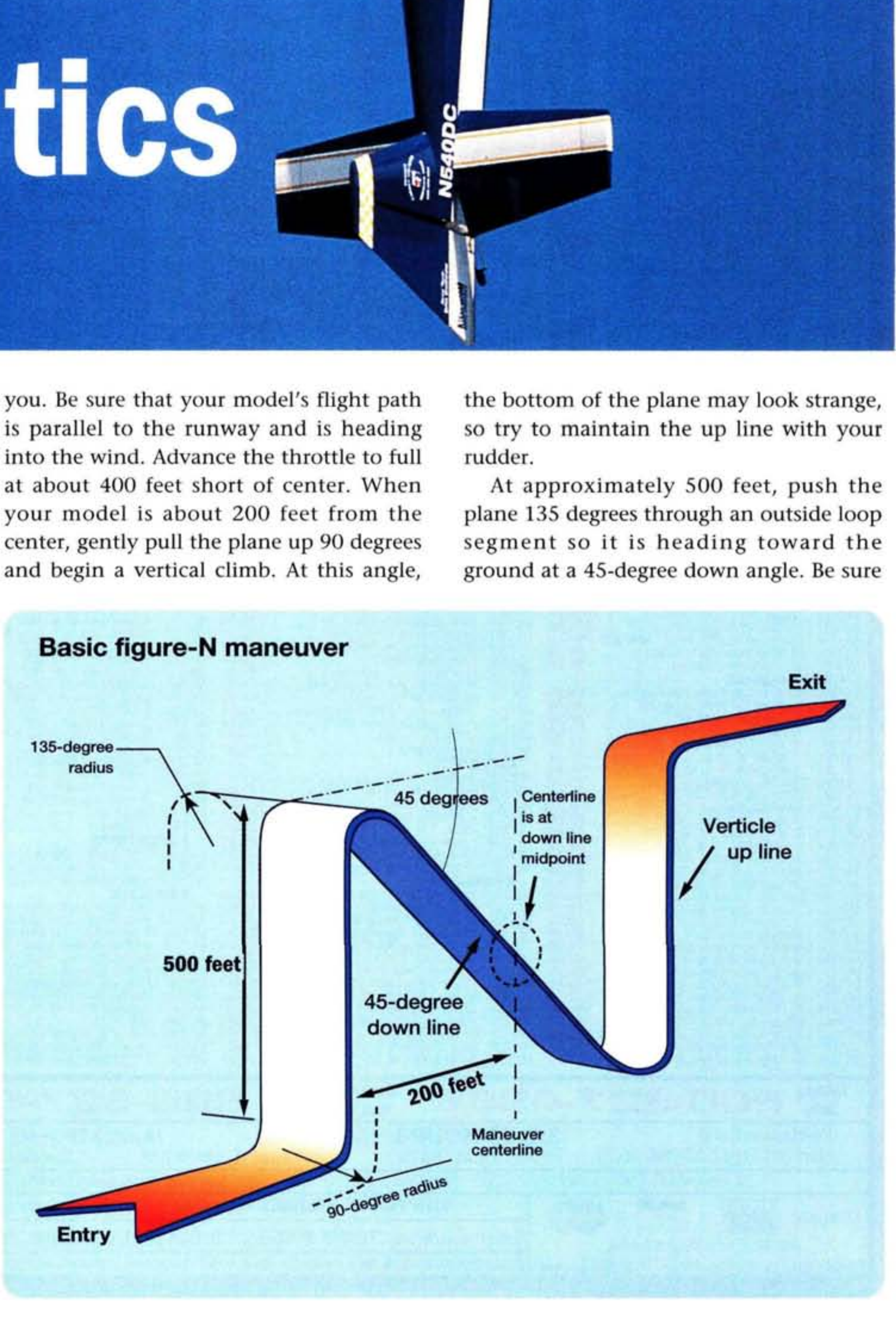
by Dan Wolanski

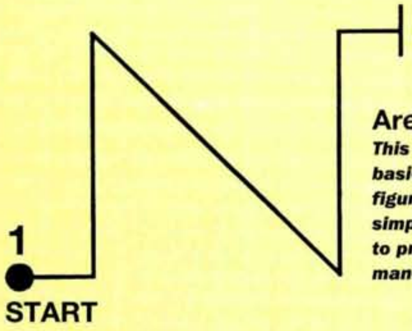
As the name implies, the figure-N is an aerobatic maneuver shaped like the letter "N" (see Aresti Figure 1). It's made with two vertical lines connected by a 45-degree segment. International Miniature Aerobatic Club (IMAC) rules require that the vertical lines be the same length, and that all the corner radii must be the same. It has one of the highest base-K factors (degree of difficulty) in the catalog of figures because it requires quite a bit of skill to properly fly the maneuver. The basic figure-N first appears in the IMAC Advanced sequence. Point or hesitation rolls are added to the various line segments to further increase the maneuver's difficulty. In Unlimited competition, the figure is used in conjunction with snaps, spins, point and hesitation rolls. At first glance, the maneuver seems simplistic. But don't be fooled; the figure-N requires a lot of practice, patience and diligence to perform it correctly.

FLYING THE FIGURE N

The center of the figure-N is the midpoint of the 45-degree down line, so you need to start the maneuver before you reach the centerline of the box. Get into position by flying straight and level approximately 100 feet high and 100 yards in front of you. Be sure that your model's flight path is parallel to the runway and is heading into the wind. Advance the throttle to full at about 400 feet short of center. When your model is about 200 feet from the center, gently pull the plane up 90 degrees and begin a vertical climb. At this angle, the bottom of the plane may look strange, so try to maintain the up line with your rudder.

At approximately 500 feet, push the plane 135 degrees through an outside loop segment so it is heading toward the ground at a 45-degree down angle. Be sure





Aresti figure 1

This illustration shows the basic segments of the figure-N; although it looks simple, it takes a lot of skill to properly perform the maneuver.

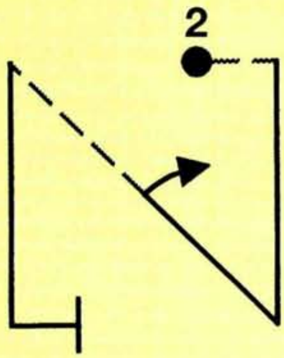


Figure 2

Figure-N from top.
From inverted.
Go past center.
Pull 90 degrees straight down.
Pull 135 degrees to 45-degree up line.
½ roll on 45-degree up line.
Pull 135 degrees at top.
Exit upright.

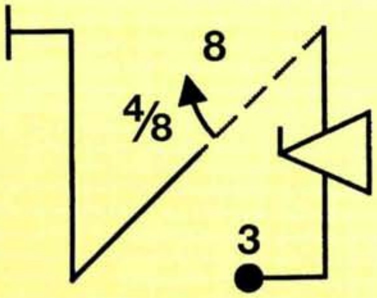


Figure 3

Figure-N.
Go past center.
Pull vertical.
1 positive snap up.
Pull 135 degrees to 45-degree inverted down line.
4 of 8-point roll to upright on 45-degree down line.
Pull 135 degrees to vertical.
Push at top.
Exit upright.

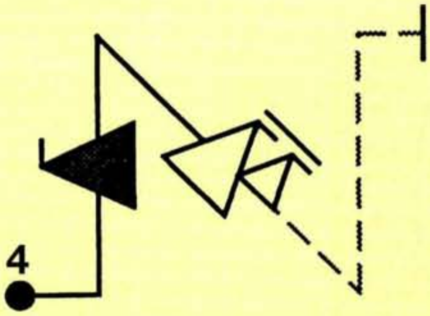


Figure 4

Figure-N.
Pull vertical.
1 negative snap up.
Push 135 degrees to 45-degree down line.
1½ positive snaps on 45-degree down line to inverted.
Push 135 degrees to vertical.
Pull 90 degrees on top.
Exit inverted.

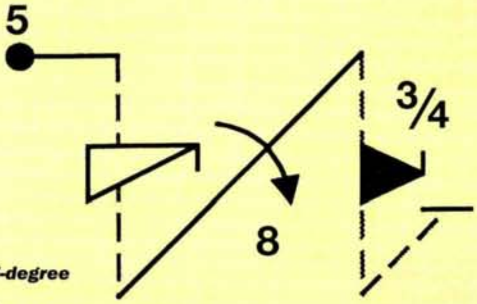


Figure 5

Figure-N.
1 positive spin entry.
Pull to 45-degree up line.
8-point roll on 45-degree up line.
Push to down line.
¾ negative snap on down line.
Exit inverted and cross-box.
Try adding an inverted rolling circle at this point, just for kicks!

this radius matches that of the first maneuver. The key to this segment is throttle management; starting about halfway through the push radius, gently decrease the throttle to idle. When you reach the 45-degree down line, the throttle should be at idle, or just a few clicks above, to maintain a constant 45-degree down line.

Let the model continue through the center of the down line until it's about 100 feet above the ground and 200 feet past the maneuver's centerline. Advance the throttle to full just before you pull the model into the last 135-degree radius to enter the second vertical up line. This is where a very strong engine is important. If your plane doesn't have at least a 1.5:1 power-to-weight ratio, you'll have to build up more speed during the 45-degree down line to gain enough energy for the climb. Again, be sure that the pull radius matches the previous two. Climb to about 500 feet, and then gently push the plane 90 degrees back to straight-and-level flight while you maintain the same radius size as before. Exit the maneuver straight and level heading into the wind.

See how difficult the figure-N can be? It isn't easy to match all those radii and establish and maintain a true 45-degree down line. All you have to do now is practice!

VARIATIONS

Once you're comfortable with the basics, give the more complete versions a try. You can create hundreds of combinations with the figure-N. IMAC Advanced and Unlimited pilots perform the maneuver in combination with snaps and rolls as shown in Figures 2 and 3. At the Tournament of Champions and the World Aerobatic Masters, you will see many figure-N maneuvers flown with multiple snap and roll combinations as shown in Figures 4 and 5. The key to all of these variations is practicing the basic figure-N and mastering its geometry before you add "decorations" to the line segments. Have fun!

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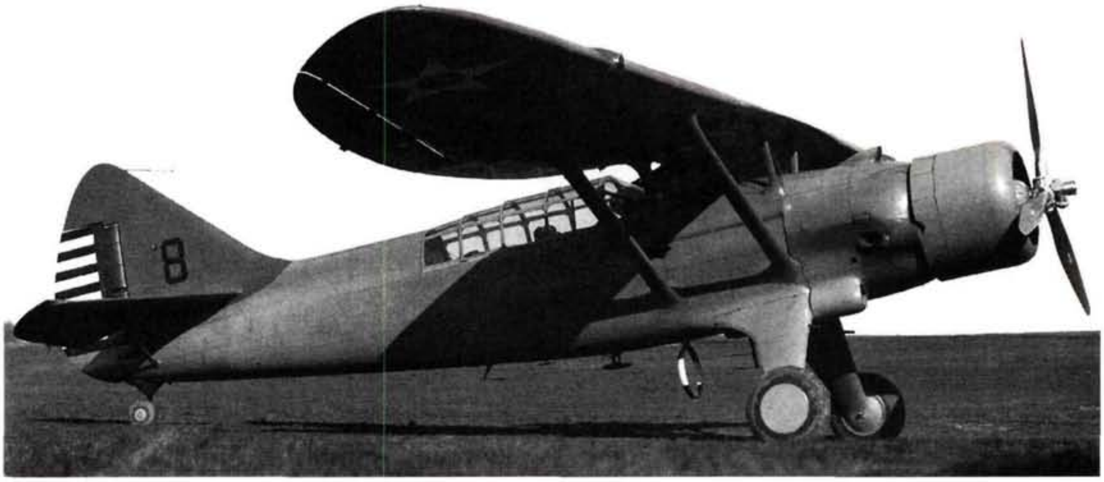

Congratulations to Robert Laplaca of Elmwood Park, NY. Robert knew that May's mystery plane was the Stinson Voyager. Though production of the original, three-seat 105 Voyager began just before WW II, it was discontinued when America entered the War. Following the War, production resumed with the Model 125 Voyager. The prototype (shown here) was first test-flown in December 1944. Powered by a 125hp Lycoming engine, the 125 Voyager had a 470-mile range with a cruising speed of 112mph. It had ample room for two or three passengers in addition to the pilot, plus baggage. Long windows provided both passengers and pilot with a great view. The standard post-war Voyager, Model 108, Voyager 150, was fitted with a 150hp Franklin 6A4-150-B3 engine.

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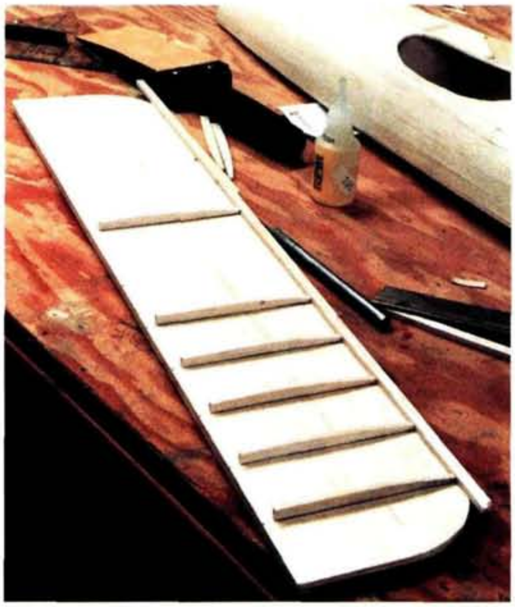
by Dick van Mourik

Tail structure construction

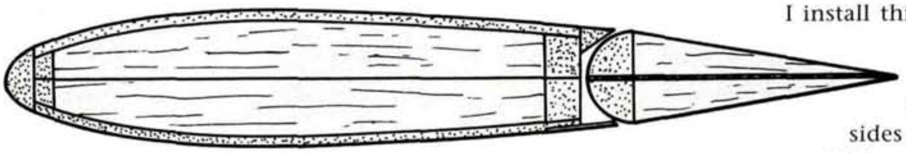
Many full-size aircraft have a vertical fin and a horizontal stabilizer constructed of wooden or metal frames. Though this construction method is rarely used with smaller models, framed structures are particularly appropriate for scale construction.

Depending on whether the subject aircraft has a fabric-covered fin or one sheeted in wood or metal, I use one of two construction methods. For a metal-sheeted fin such as that on a Spitfire and a Miles Sparrowhawk, I use a 1/16-inch balsa core and glue half ribs to each side to give the fin its shape. If you use half ribs, it is easy to keep the parts straight and true; the technique also eliminates the need to build tabs to maintain rib alignment. With larger fins—about 2-foot span and larger—the balsa-sheet core alone often isn't rigid enough. I install an auxiliary spar at about 33 percent of the fin's mean aerodynamic chord. This spar fits into notches in the ribs that are at about 2/3 the rib's height to prevent the spar from showing through the covering. Although this structure still looks fragile, it is more than rigid enough once it has been sheeted and finished.



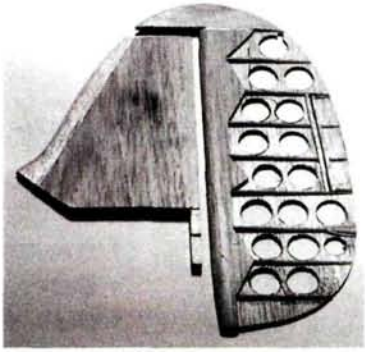
Here, I am building a simple horizontal stabilizer using half-rib construction. Building tabs aren't required to keep the structure straight and warp free.

Figure 1. A typical half-rib construction without center-core sheeting



Top view of fin structure

There are several ways to build scale tail surfaces. Here, on a full-size Spitfire, the vertical fin is sheeted and the rudder is fabric-covered. It's important to duplicate these features on a scale model.



I made my Spitfire fin and rudder using the half-rib construction technique—light and very strong.

I also use half-rib construction when building sheeted fins, but I do not use the central core. The advantage of using two half ribs is that you can build the fin halves separately on a flat plate. Then, when you've joined them, they will always be true (Figure 1). Sheeted structures rarely require spars of any kind because the sheeting itself is rigid enough to support the construction.

STABILIZER ATTACHMENT

The horizontal stabilizer is usually placed in a saddle made of 1/4- to 3/8-inch-thick balsa sheet that is then glued to the rear fuselage framework (Figure 2).

When dealing with an aircraft that has a stabilizer high in the vertical fin, such as with the Henschel 126, I install thin plywood or balsa doublers inside both sides of the fin, and I insert the fin into an 1/8-inch balsa base. If the aircraft features a fairly small fin, like the Messerschmitt Bf-109's, I make the fin out of solid balsa and insert two 1/8-inch plywood T-pieces into the stabilizer. Both of these methods are shown in Figure 3.

RUDDER CONSTRUCTION

When you construct a model using ribs, you can build a rudder in the same way as you made the fins. To produce a scale trailing-edge thickness, I don't use the usual 1/16-inch balsa core; I use 1/64-inch plywood. Of course, there are always exceptions to this, and one of them is

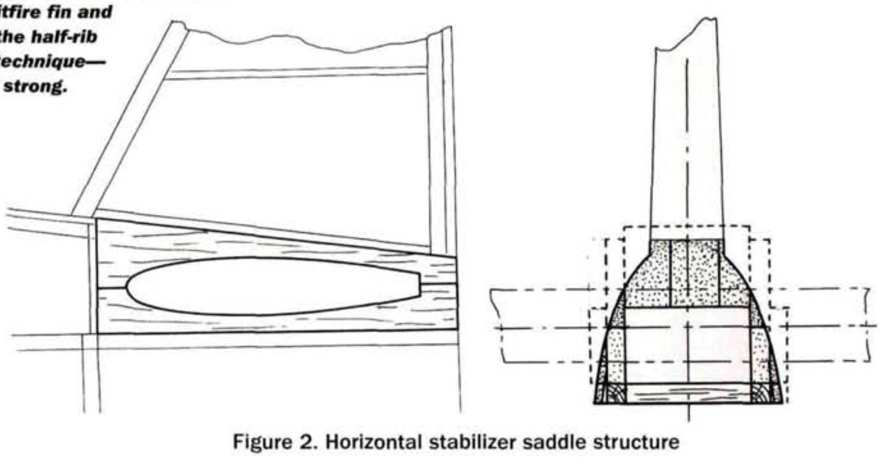
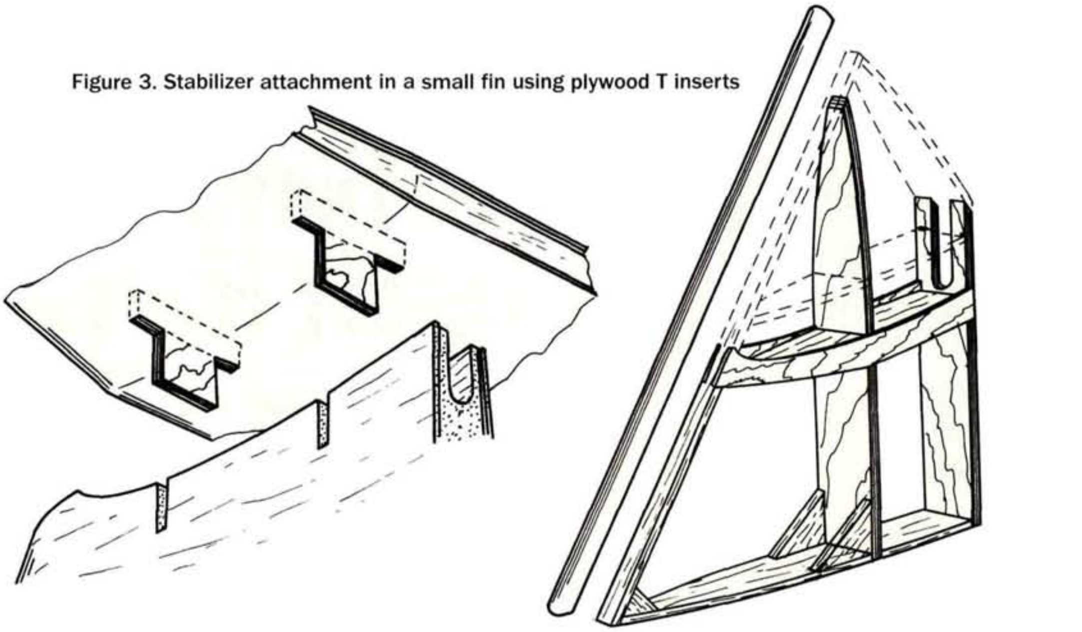
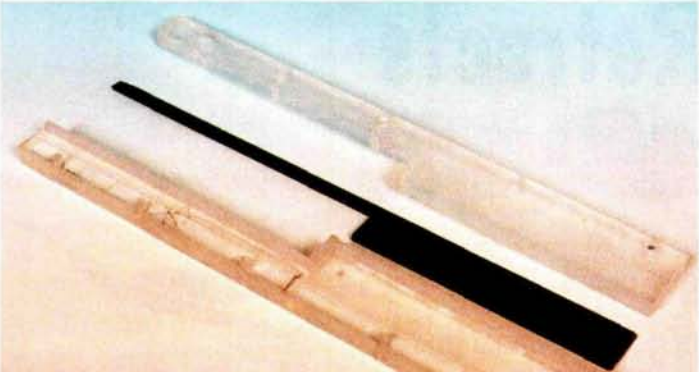


Figure 2. Horizontal stabilizer saddle structure

duplicating a full-size aluminum-covered rudder. I build these as sheet structures and make cutouts in the sheeting. If the rudder isn't too big, I use a 1⁄64-inch plywood core and glue balsa blocks on both sides; then I make the cutouts. Figure 4 shows an elevator half for an Fw 190. You can reduce weight by making cutouts in the core sheeting, but in my experience, this doesn't save enough weight to make it worth the effort. Additionally, the cutouts in the core sheets may cause the trailing edge to bend or warp.

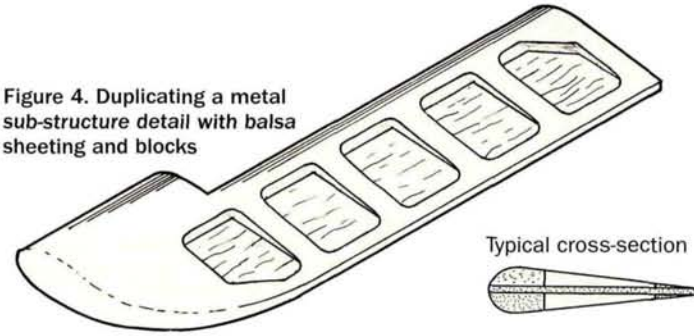
Figure 3. Stabilizer attachment in a small fin using plywood T inserts





Here are the Plexiglas molding plates I made to form the Zlín's carbon-fiber trailing edge.

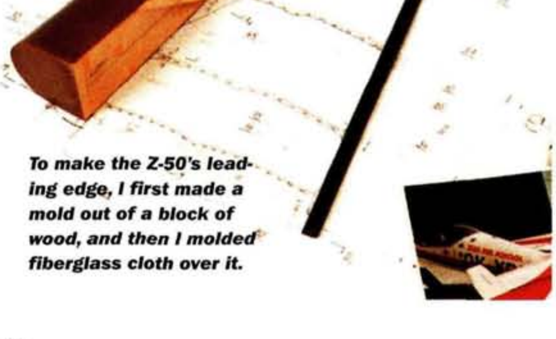
Figure 4. Duplicating a metal *sub-structure* detail with balsa sheeting and blocks



CONSTRUCTION CHALLENGE—ZLÍN Z-50 RUDDER

I recently encountered a problem while working on my 1⁄4-scale, Zlín Z-50's unusual rudder. It tapers inward from the leading edge to about 4 inches in front of the trailing edge, and then it widens outward to increase the thickness of the trailing edge. This design is probably intended to form some sort of turbulator to prevent flutter. My solution to the design's complexity was to build the trailing edge out of molded carbon fiber. I made the mold out of two Plexiglas plates that I tapered as required using a circular saw. I built a rim around one of the halves to keep the carbon fiber in place while I molded the trailing edge. I left the mold's top and bottom open to allow the surplus resin to be pressed out.

At 1⁄4 scale, the Z-50's rudder is quite big, so making its leading edge out of solid balsa was a definite no-go. I could have used a wrap of 1⁄64-inch plywood or 1⁄16-inch balsa sheet, but because the leading edge has such a small radius, I couldn't do this. I decided to use molded fiberglass here as well. I made a simple mold out of a block of wood, filled the grain, waxed it and applied PVA mold-release agent; then I added a layer of 1-ounce fiberglass cloth. To make it more rigid, I oriented the weave at 45 degrees to the leading edge. To make the finished surface very smooth, I put a piece of a plastic food bag over the cloth while the resin was still wet. The result is a very light, stiff leading edge that I glued to the rudder with CA.



To make the Z-50's leading edge, I first made a mold out of a block of wood, and then I molded fiberglass cloth over it.

For those who have access to a vacuum-forming machine, ABS sheet plastic is an alternative. Don't use styrene because over time, it will become brittle and eventually break. Fiberglass cloth and epoxy resin, on the other hand, will last as long as the model.

That's it for this month. I hope you try some of these techniques in your own scale projects and have fun doing so. Next time, I'll look at engine cooling and discuss installing mufflers under scale cowls. See you then. ✈

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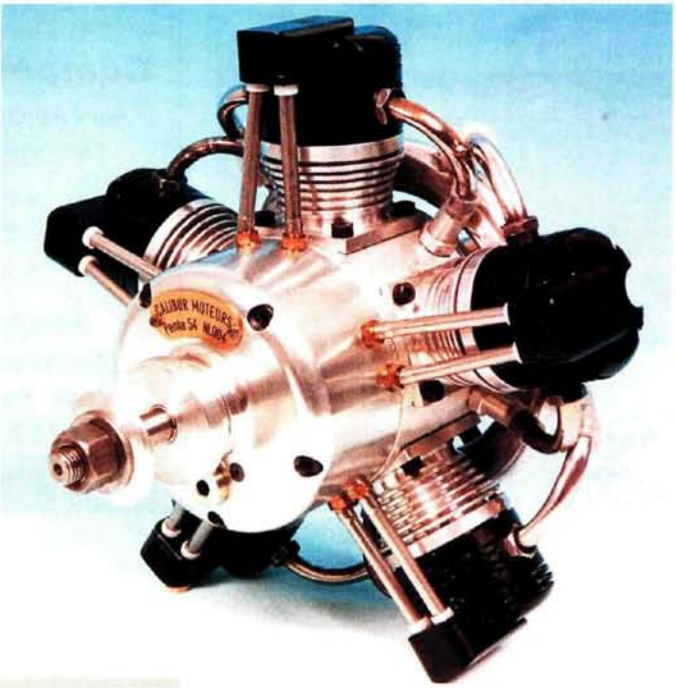
BY DICK VAN MOURIK

A well-rounded performer

Scratch-built engines are rare in RC models, and radials are even rarer. Designing, building and operating your own 5-cylinder radial is daunting, to say the least. Dick van der Veldt of the Netherlands picked up the gauntlet, and the result is the Penta 54 engine you see here. The story of this engine starts in 1999, when Dick was shown a German plan for a radial engine while visiting a fellow club member. At the time, Dick was building an 18-percent FW-190, and no available radial engine would fit the model without protruding through the cowl.



Although nothing was wrong with the basic layout of the engine on the plan, Dick wasn't satisfied with the construction. Furthermore, the diameter was too large for his purposes, so he decided to design his own radial. An engineer by profession, Dick had access to all the machinery needed for such a massive job, so he drew up his design and started construction in July 1999.

The prototype 5-cylinder radial had a bore of 23.4mm (0.92 inch) and a stroke of 24mm (0.94 inch), giving it a displacement of 52cc (3.15ci); hence, the designation "Penta 52." Because it was to be fitted in the FW-190, the engine diameter could not exceed 230mm (9.05 inches). It used valves, pistons and piston rings from the popular Saito FA-50 as well as a SuperTigre Mag carburetor and O.S.-type "F" glow plugs.

The engine features some interesting design aspects, including a completely separate front and rear crankcase. Lubricating the valve gear can be a real problem with this kind of engine, but Dick solved this by using a separate oil chamber in the front of the crankcase. This allows the engine to be run on fuel with relatively low oil content. He used Saito pistons, and he made the linings out of nitrated C 45 steel, honed for better surface quality. He made the valve rods (a sensitive part of any 4-stroke engine) of hardened steel. The radiuses on the lower end run in a small hemispherical dent in the cam rod.

The cam plate itself is made in two separate pieces that are bolted together; this enables the engine to be run in the opposite direction when the inlet and exhaust sides are reversed and the two parts of the cam plate are repositioned. This makes the engine suitable for twin setups.

The entire concept is well designed and allows adjustments to be made without modifications to the basic engine. For instance, different carburetors can be fitted, and experimenting with these requires only that you loosen three small screws.

The engine first ran on New Year's Day 2000, which means that the engine went from concept to working model in about six months—an amazingly short time, considering how much of the engine was homemade. It was put through its paces on a test stand, where the results were very promising. At only 5.8 pounds, the engine turned a Menz wooden 20x8 prop at 7,000rpm and was able to run as low as 1,500rpm. No glow driver was needed at lower rpm.

Dick decided to build a small run of six engines. He made some minor improvements to the prototype Penta 52; the revised design was renamed "Penta 54." Saito valves were again used on the 54, but Dick made his own pistons and rings. The aluminum pistons have been anodized to improve their mechanical properties. While he was at it, Dick increased the bore slightly, and this added horsepower; the engine now turns a Menz 20x10 prop at 7,000rpm.

SPECIFICATIONS

DIAMETER: 221mm (8.72 in.)

LENGTH: 146mm (5.75 in.)

BORE: 24mm (0.94 in.)

STROKE: 24mm (0.94 in.)

DISPLACEMENT: 54cc (3.31ci)

HORSEPOWER: 3.7hp @ 7,000rpm

WEIGHT: 5.8 lb. without collector ring

OPERATING RANGE: 1,500 to 7,500rpm

FUEL: 9% synthetic blend with 4% nitro

Left: in the second-generation Penta 54, all the internal components except the valves are homemade. Center: the engine features a front and rear two-piece crankcase. To make sure the valve gear stays properly lubricated, the front half of the case has its own oil chamber. Right: the valve rods are machined from hardened steel for durability. The two-piece cam plate can be reassembled for opposite-direction rotation when the intake and exhaust ports are reversed.